Journal of

FORESTRY

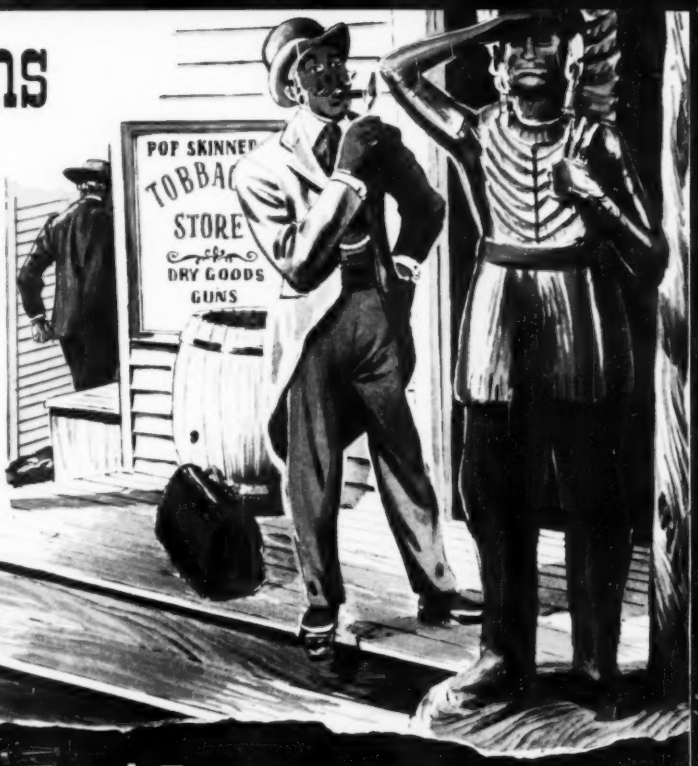
JULY 1952

SOCIETY OF AMERICAN FORESTERS 1900

Volume 50
Number 7

Famous Indians

For half a century the cigar store Indian stood poker faced in front of tobacco shops as an identifying symbol. Although cigar store Indians are a rare sight today, they were for many years a part of American life and as such instantly recognized by young and old. Whether or not he could read, the man who wanted a chew or a cigar knew where to go to buy it.



Have you ordered INDIAN FIRE PUMPS for Civil Defense? Be Prepared!

and Famous, too, are

INDIAN FIRE PUMPS

in providing protection to thousands of users

The portability, capacity and all 'round efficiency of INDIAN FIRE PUMPS makes them ideally suited for putting out small fires before they spread into big ones. Clear water alone does the job. How is your supply of INDIAN FIRE PUMPS? Do you have an ample supply for any emergency? Order now. We will ship promptly.

Smith INDIAN Backfiring Drip Torch

Widely used for slash disposal, burning right of way, etc. 1 gal. tank. Brass feed pipe. Strong construction. Designed for fire department backfiring work.

Smith INDIAN Drinking Water and Supply Tank

For carrying drinking water to fire fighting crews, and refilling Indian Fire Pumps. 5-gal. capacity. Push button faucet. Carries by handle or slung on back.

Write for bulletins describing above products

D. B. SMITH & CO.

PACIFIC COAST BRANCHES:

Hercules Equipment & Rubber Company, Inc.
415 Brannan Street
San Francisco 7, California

Roy G. Davis Company
617 East Third Street
Los Angeles, California

Fred E. Barnett Company
2005 S. E. 8th Ave.
Portland, Oregon

Fred E. Barnett Company
600 Spring Street
Klamath Falls, Oregon

Titan Chain Saws, Inc.
2700 Fourth Avenue South
Seattle, Washington

L. N. Curtis & Sons
426 West Third Street South
Salt Lake City, Utah

CANADIAN AGENTS:

Fleck Bros. Limited
110 Alexander Street
Vancouver, B. C., Canada

C. E. Hickey & Sons, Ltd.
Hamilton, Canada

VOLUME 50 ● NUMBER 7 JULY 1952

Journal of Forestry

Editorial Staff

ALBERT G. HALL ..... *Editor*
HENRY CLEPPER ..... *Managing Editor*
L. AUDREY WARREN ..... *Business Manager*

Associate Editors

HAROLD H. BISWELL, *Range Management*, School of Forestry, University of California, Berkeley 4, Calif.

C. FRANK BROCKMAN, *Forest Recreation*, College of Forestry, University of Washington, Seattle 5, Wash.

CHARLES C. BUCK, *Forest Fire*, California Forest and Range Experiment Station, P.O. Box 245, Berkeley 1, Calif.

S. R. GEVORKIANZ, *Mensuration*, Lake States Forest Experiment Station, University Farm, St. Paul 1, Minn.

W. D. HAGENSTEIN, *Forest Management and Engineering*, Industrial Forestry Association, 1410 S. W. Morrison Street, Portland 5, Oreg.

GEORGE H. HEPTING, *Forest Pathology and Entomology*, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Federal Building, Asheville, N. C.

HERBERT B. MCKEAN, *Forest and Wood Utilization*, Timber Engineering Company, 1319 18th Street N. W., Washington 6, D. C.

CARL E. OSTROM, *Silviculture*, Southeastern Forest Experiment Station, 223 Federal Building, Asheville, N. C.

J. W. B. SIRAM, *World Forestry*, Faculty of Forestry, University of Toronto, Toronto, Ont., Canada.

H. G. WILM, *Forest Influences and Soils*, Forest Service, U. S. Department of Agriculture, Washington 25, D. C.

ROBERT K. WINTERS, *Forest Economics and Policy*, Central States Forest Experiment Station, 111 Old Federal Building, Columbus 15, Ohio.

LEE E. YEAGER, *Forest-Wildlife Management*, Colorado Cooperative Wildlife Research Unit, 115 Forestry Building, Colorado A & M College, Fort Collins, Colo.

LLOYD THORPE, *Advertising Representative*, 209 Seneca Street, Seattle 1, Wash.

The JOURNAL OF FORESTRY, established in 1917, is the official organ of the Society of American Foresters, but the Society assumes no responsibility for the statements and opinions expressed by contributors.

Publication office, 825 Mills Building, 17th Street at Pennsylvania Avenue N. W., Washington 6, D. C. Address all correspondence concerning editorial or business matters to JOURNAL OF FORESTRY, 825 Mills Building, 17th Street at Pennsylvania Avenue N. W., Washington 6, D. C. Published monthly. Subscriptions $6 per year; single copies 60 cents. Missing numbers will be replaced without charge provided claim is made within thirty days after date of the following issue.

The editors are not responsible for loss or damage of manuscripts and photographs while in transit or in their possession. All material submited for publication should be accompanied by return postage.

Copyright, 1952, by the Society of American Foresters.

Entered as second-class matter at the post office at Washington, D. C. Acceptance for mailing at the special rate of postage provided for in the Act of February 28, 1925, embodied in Paragraph 4, Section 412, P. L. and R., authorized November 10, 1927.

CONTENTS

COVER: Spraying to Control Douglas-Fir Tussock Moth, Idaho (see page 544).
Bureau of Entomology and Plant Quarantine Photo.

Effect of Winter Burning on Growth of Slash Pine in the Flatwoods — *George F. Gruschow* — 515

Age Variability of Northern Red Oak in the Upper Mississippi Woodlands — *Harold F. Scholz* — 518

The Vegetation-Soil Survey in California and Its Use in the Management of Wild Lands for Yield of Timber, Forage and Water — *A. E. Wieslander* and *R. Earl Storie* — 521

Production of Naval Stores in Les Landes, France — *John M. Fenley* — 526

An Approach to Density Measurement in Douglas-Fir — *Philip A. Briegleb* — 529

The Paper Industry and the Southland Mill — *W. L. McHale* — 536

The Effect of Source of Seed on Growth of Jack Pine — *T. Schantz-Hansen* and *R. A. Jensen* — 539

Blister Rust Damage at Waterford, Vermont — *P. L. Rusden* — 545

Deterioration of Site Quality by Erosion — *Joseph Kittredge* — 554

Notes — 557

A Method of Transplanting Small Shallow-Rooted Trees; A Table of Production Rates for Cutting Spruce and for Pulpwood; Identification of Very Small Birch Seedlings; Heavy Mortality Does Not Always Follow Partial Cuttings of Hemlock Hardwood Stands; An Analysis of Deterioration in Farm Structures; An Unusual Type of Frost Injury in Pine; New Forestry College on Cyprus Serves Middle East.

Points of View — 562

Grazing Damage in Southwest; Forest Practice Based on Facts, Not Fancy (four articles); The Cost of a Scientific Journal—A Correction; More About a Scientific Journal in Forestry.

Reviews — 566

Gifts from the Forest; American Universities and Colleges; Forest Inventory; Jareb.

Current Literature — 568

Society Affairs — 569

Forestry News — 578

Before you buy anybody's MICROWAVE SYSTEM

Consider these 5 facts!

1. Who is the manufacturer?

When you specify RCA, the answer is easy. Because RCA is the world's greatest name in radio, television, and related activities. RCA has pioneered in high-frequency radio communications and really knows microwave from start to finish.

2. What has he actually done in the microwave field?

Again, RCA has rolled up an impressive record. Installed and operating are more than 19,000 channel miles of RCA microwave systems, for pipelines, power utilities, turnpikes, and government agencies. One system is over 1000 miles long, extends from New York to Washington and Pittsburgh. And after three years' continuous experience, expansion is being planned . . . proof enough of *outstanding RCA performance.*

3. Is he equipped to install microwave?

Again, with RCA, the answer is "yes." RCA will handle your installation for you . . . will even furnish you with a detailed aerial survey of the microwave route.

4. Is he equipped to maintain microwave?

Again, RCA is out in front, with a nationwide service organization geared to handle your microwave maintenance on a 24-hour basis. It's the *RCA Service Company*—already well known for its service to industry on other types of electronic equipment. It's available to you when *you* specify RCA.

5. Is the equipment designed with an eye to the future?

Yes . . . if it's RCA equipment.

For instance—consider the matter of adding additional voice and signal channels. Thanks to RCA's "eye to the future" design, you can add or drop channels at any station with a minimum of cost . . . a minimum of equipment.

Why settle for less than RCA MICROWAVE?

When you start talking about microwave, you're talking about *money.* So isn't it just good sense to be sure you invest in the best? With RCA, you're dealing with the leading name in radio . . . with men who *know* microwave. *So specify RCA—and be sure.*

You get these 7 plus features with RCA Microwave

1. Uses conventional tubes throughout.
2. Easy to tune. Has built-in metering.
3. Handles large number of single sideband frequency division channels without excessive cross-talk.
4. Flexible. Any or all voice or control channels can be picked up or dropped at any station, repeater or terminal.
5. Service channel with signaling available at each repeater and terminal station.
6. Vertical space, provides ready access both front and rear.
7. Designed, built, and backed up, by RCA . . . world leader in electronics.

RCA

RADIO CORPORATION of AMERICA

MORE INFORMATION? MAIL COUPON TODAY

RCA Communications, Dept. 126G, Camden, N. J.

Without obligation, please send me more information on RCA Microwave for the specific application indicated:_____

Name_____

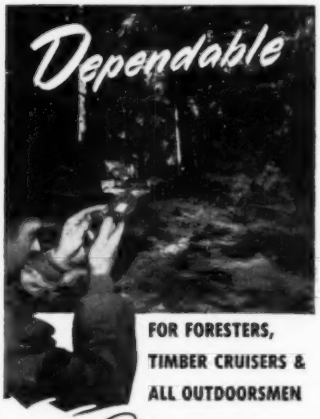
Position_____

Company_____

Address_____

City_____ State_____

☐ Please have an RCA Microwave Engineer call on me.



FOR FORESTERS, TIMBER CRUISERS & ALL OUTDOORSMEN

LEUPOLD *Engineered* PRECISION *Compasses*

Men whose jobs depend on making accurate preliminary surveys specify LEUPOLD Compasses for greater convenience, accuracy and dependability. In no other compasses are dimensions, weight and size of dial so ideally proportioned. Exclusive external declination adjustment.

The CRUISER . . .

Choice of timber cruisers who require a compact instrument with easy-to-read dial. Inner diameter of dial is 2½ inches, graduated to single degrees and marked for both quadrant and azimuth readings. **$12.75**

The SPORTSMAN . . .

First choice of outdoorsmen. Similar to the CRUISER but with 1¾-inch dial diameter. Weights only 4 ounces. **$8.35**

The FORESTER

Versatile surveyor's staff compass of highest quality. Mounts on Jacob's staff or tripod. Graduated straight edge for plane table work. Permanently mounted circular spirit level. 3¼ inch inner dial diameter.

Model A **$40.00**

Model B, with vertical angle scales and sights, and 5-minute vernier. **$50.00**

MAIL THIS COUPON TODAY

Enclosed is ☐ check or ☐ money order for $_____
Please send the LEUPOLD Compass checked below.

_____ The CRUISER @ $12.75
_____ The SPORTSMAN @ $8.35
_____ The FORESTER Model A @ $40.00
_____ Model B @ $50.00
☐ Send literature.

NAME_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

LEUPOLD & STEVENS INSTRUMENTS, Inc.
4445 N. E. Glisan St., Portland 13, Ore.

Journal of Forestry

Official Organ of the Society of American Foresters

Effect of Winter Burning on Growth of Slash Pine in the Flatwoods

George F. Gruschow
Southeastern Forest Experiment Station,
Lake City Branch, Fla.

WINTER HEADFIRES cause a marked reduction in the subsequent height and diameter growth of slash pine (*Pinus caribaea* Morelet) but prescribed burning by backfires has little or no effect, providing the trees are more than about 12 feet high. These results and some data on mortality were obtained from a study[1] on the Osceola National Forest, and are pertinent to the use of fire in the management of slash pine in the flatwoods region of the Southeast.

The "flatwoods" of southeast Georgia and northeast Florida are characterized by level, sandy, poorly drained soils with numerous shallow depressions which may or may not contain water, depending upon seasonal and local climatic conditions. The minor vegetation consists largely of wire grass (*Aristida* sp.), saw-palmetto (*Serenoa repens* (Bartr.) Small) and gallberry (*Ilex glabra* L.). Longleaf pine (*Pinus palustris* Mill.) and slash pine are the major tree species outside the swamp. Slash pine is well adapted to this region and can reproduce naturally except on small areas of deep, well-drained, sand known as scrub oak ridges. Frequent wildfires in the past have militated against slash pine and favored the establishment of longleaf pine on much of the area. With better protection from fire, slash pine is becoming established as rapidly as the seed supply and related factors permit. Complete fire exclusion, however, is accompanied by a rapid accumulation of large quantities of inflammable material (*2*) on the ground. This amassment of fuel in a region where "dry" lightning is common, and where the forests are continually traversed by woods workers and naval stores laborers, creates an extremely high hazard which can lead to disastrous wildfires.

Table 1.—Percent Mortality of Slash Pine Due to Burning

	Trees under 11.5 feet in height	Trees 11.5 feet high and over
Litter fuel type		
Backfire	2	0
Headfire	90	14
Grass fuel type		
Backfire	52	0
Headfire	73	8

Prescribed fire is now an accepted tool in the management of the longleaf-slash pine type in the flatwoods. The background and techniques of prescribed burning (*1, 4, 6*) have been published earlier. This report presents evidence of fire effects on slash pine from a study which included two surface fuel types and three degrees of burning—unburned, head fire, and backfire—giving six treatment categories. Uniform stands of representative size classes were selected throughout the 160,000 acres of the national forest for plot locations. The plots, each one-tenth acre in area, were established well within stands that were scheduled for a regular prescribed burn during the winter of 1943-44. These plots were divided equally between the two major surface fuel types, "grass" and "pine litter." Seventy-two plots enter into the present analysis. Burning was done as a part of the regular prescribed burning operation in December, January, and February. The fires were set in the late afternoon and burned into the night. The plots which were set up for backfiring received the usual prescribed burning treatment. Headfires, for plots receiving that treatment, were obtained by supplemental spreading of the prescribed fire as it approached those stands. The fire was spread around sufficient area to obtain a headfire which swept uniformly over the tenth-acre plot. The check plots were not burned.

In a preliminary analysis of this study Mann (*5*) concluded that practically all mortality occasioned by the fire occurred in the year following the burn and was completed by the end of the second measurement; also, that subsequent diameter and height growth decreased

Table 2.—Effects of Burning on Subsequent Growth of Slash Pine

	Trees	Average crown scorch	Mean height 1944	Mean height growth 1944-49	Mean diameter 1944	Mean diameter growth 1944-1949
Litter fuel	*Number*	*Percent*	*Feet*	*Feet*	*Inches*	*Inches*
Unburned	368	—	29.07	12.04	3.75	1.13
Backfire	401	6	29.44	11.82	3.78	1.16
Headfire	234	73	26.33	9.46[1]	3.54	.92[1]
Grass fuel						
Unburned	119	—	23.29	14.40	3.66	1.72
Backfire	56	18	20.73	15.19	3.31	1.77
Headfire	78	81	24.37	8.72[1]	3.41	.93[1]

[1]Significant at the 1-percent level.

[1]This study was installed in 1943 by C. A. Bickford, who was then with the Southern Forest Experiment Station.

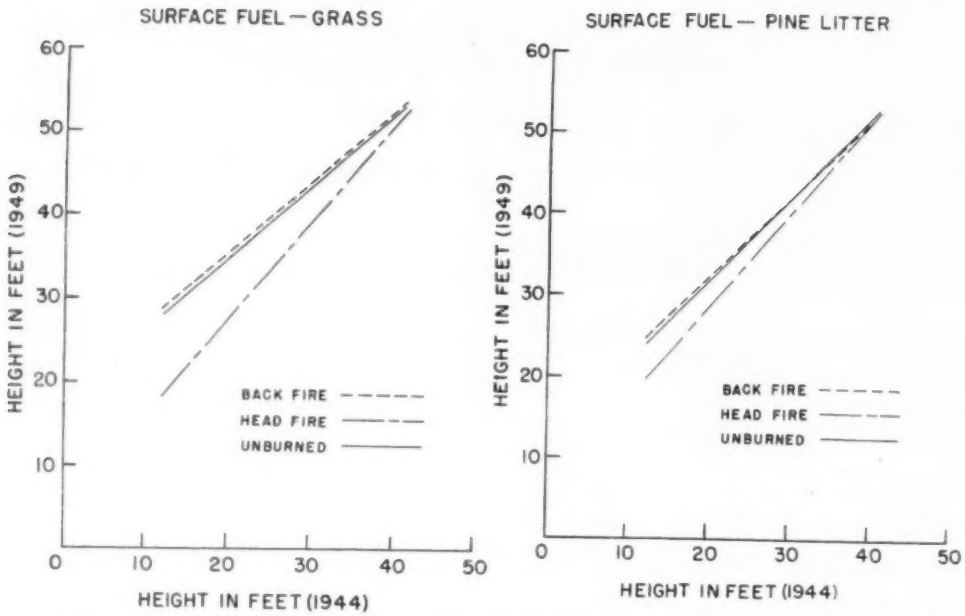


FIG. 1.—Height growth of young slash pine is significantly reduced by headfires in both grass and pine-litter fuel types.

with increased scorch and foliage consumption.

McCulley (*3, 4*), using data from early remeasurements on this study, developed a prediction equation for mortality of slash pine based on diameter, the percent of foliage scorched, and the percent of needles consumed by fire. McCulley also showed that height growth is more sensitive to fire damage than is diameter growth, as trees up to 7 inches in diameter showed a reduction in height growth immediately after burning even though there was no scorching of the foliage, while scorching up to one-third of the crown had no adverse effect on the diameter growth of trees over 3 inches in diameter.

After the fifth-year remeasurement of the plots, the data were analyzed to compare the effects of burning by a prescribed backfire versus a headfire. The data on mortality, as shown by Table 1, bear out the generally accepted theory that prescribed burning slash pine under approximately 12 feet in height is not advisable. The tallest tree killed on the plots burned by the backfire was in the 8-foot height class, while the headfires killed a tree 36 feet tall.

The data were segregated according to treatment, and within each of the six treatments the trees were regrouped by 1-foot height classes on the basis of the 1944 measurements. A total of 1,256 individual trees exceeding 11.5 feet in height was used in the analysis. All height classes from 12 to 53 feet were represented. The mean height of the trees in 1944, the mean diameter, the average percent of crown scorched by fire, and the average height and diameter growth during the next 5 years are given in Table 2 by groups. Regressions were computed for the 1949 heights and diameters over the 1944 heights and diameters for each group. The variation in the regressions for the various classes of burning as shown by Figures 1 and 2 reflect the differential effect of the types of fire treatment.

Statistical analyses of these data show that:

a.—For both fuel types:

1. There was no significant difference in height growth or diameter growth between trees on plots burned by backfire and those on unburned plots.
2. There is a highly significant reduction in the height and diameter growth of trees on plots burned by a headfire.

b.—Comparison of the two fuel types:

1. Trees on unburned plots grew faster on the grass fuel type.
2. On both fuel types, headfires caused a marked reduction in growth.

The data show that prescribed burning with a backfire did not reduce the height or diameter growth of slash pine during the succeeding 5 years, provided the trees were over 12 feet in height at the time of the burn. Burning with a headfire caused a material decrease in height and diameter growth during the same period. Headfires reduced the growth of small trees more than large trees.

The greater growth of trees on

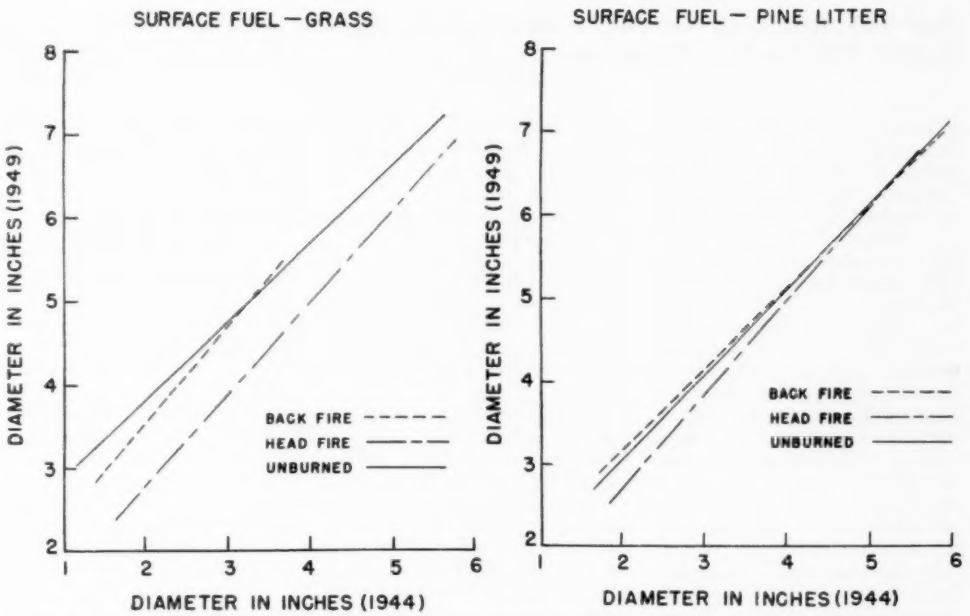


FIG. 2.—Diameter growth of young slash pine is significantly reduced by headfires in both grass and pine-litter fuel types.

unburned grass plots may be explained by the fact that the grass fuel type is typical of open stands, and the litter fuel type occurs in denser stands. The lack of competition in open stands, and the fact that the trees averaged smaller, are probably responsible for the more rapid growth. Slash pine is noted for its rapid early growth.

On the grass fuel type, burning with a backfire gave a slightly increased height and diameter growth. This apparent trend has been noted in the field and in other studies. While the difference in these data may be indicative, they are not sufficiently large to be statistically reliable.

The headfires obtained in this study were by no means as severe as might be expected from a wildfire, since they occurred during weather conditions suitable for prescribed burning, and were set at the same time that the surrounding stand was receiving a prescribed burn. The prescribed fires were set within a very few days following a rain, when some of the fuel in the lower layers still contained enough moisture to resist burning, and the burning was done during a period of steady gentle winds, estimated to be 5 to 10 miles per hour. The damage sustained from the headfires in this study then is considerably less than would be the case if the stand had been swept by a wildfire occurring during a period of high, shifting winds and with a low fuel-moisture content.

There has been some tendency recently to use headfires for prescribed burning, particularly in longleaf pine when the control of brown spot needle blight (*Scirrhia acicola* (Dearn.) Siggers) as an objective of burning. The information presented in this report shows that headfires should not be prescribed wherever slash pine is a desired component of the stand and slash pine reproduction is becoming established, as is the case with many presently understocked stands in the flatwoods. However, prescribed burning with a backfire under favorable conditions in slash pine over approximately 12 feet high results in negligible loss of growth.

Literature Cited

1. BICKFORD, C. A. and L. S. NEWCOMB. 1947. Prescribed burning in the Florida flatwoods. U. S. Forest Serv. Fire Control Notes 8(1):17-23.
2. BRUCE, DAVID. 1951. Fuel weights on the Osceola National Forest. Fire Control Notes 12(3):20-23.
3. MCCULLEY, ROBERT D. 1948. Progress report on a study of the significant factors affecting fire injury and the effect of such injury on the mortality and growth of slash pine on the Osceola National Forest. (On file at the Southeastern Forest Exp. Sta., U. S. Forest Serv.)
4. ———. 1950. Management of natural slash pine stands in the flatwoods of south Georgia and north Florida. U. S. Dept. Agric. Circ. 845.
5. MANN, JAMES M. 1947. The influence of fuel, size of tree, and type of fire on the mortality and growth of longleaf and slash pine on the Osceola National Forest. (Unpublished report on file at the Southeastern Forest Expt. Sta., U. S. Forest Serv.)
6. SQUIRES, JOHN W. 1947. Prescribed burning in Florida. Jour. Forestry 45:815-819.

Age Variability of Northern Red Oak in the Upper Mississippi Woodlands

Harold F. Scholz
Research forester, Lake States Forest Experiment Station, University Farm, St. Paul, Minn.

NORTHERN RED OAK (*Quercus borealis* Michx. f.) is the most important timber tree in southern Wisconsin, southeastern Minnesota, northeastern Iowa, and northwestern Illinois. In Wisconsin alone this species accounts for 74 percent (1.59 billion board feet, Scribner log scale) of the total estimated gross saw-timber volume on an area of 1,155,000 acres of mixed-oak woodlands (*3*). The majority of these hardwood stands developed more or less coincident with, or during the first two or three decades immediately following, agricultural development. For this reason, northern red oak forests older than one hundred years are rare.

Northern red oak occurs primarily in nearly pure and somewhat even-aged stands of good density. On the better sites, the dominant and codominant stems are characteristically straight and free of limbs to a height of 30 to 40 feet or more and average 16 to 18 inches in diameter at one hundred years. Fully stocked stands of this age have a gross volume of 12,000 to 15,000 board feet per acre. Good quality northern red oak logs have a very small amount of defect and always are in good demand for veneer, lumber, flooring, and interior trim. Top cuts and the heart sections of sawlogs find a ready market as railroad ties, and low-value wood (limbs, tops, and cull pieces) is used for fuel.

In the past, northern red oak was believed to have no serious natural enemies. Now, however, it is being attacked by the recently identified oak wilt (*4*). Too little yet is known about the spread and possible control of this disease to justify any prediction of its ultimate destructiveness.

Unfortunately, the commercial potentialities of northern red oak were not appreciated until the majority of stands had passed successively through their juvenile (reproduction, sapling, and pole) stages. As a result, there is a dearth of information on the basic ecology and silvicultural requirements of the type.

Fortunately, not all the factors of silvicultural importance have been lost or obscured by the development of the sapling and pole stands of 20 or 30 years ago into saw timber. One of these factors is the variation in the ages of dominant trees in so-called even-aged stands.

The remainder of this paper is based on an analysis of data obtained for 3,091 dominant northern red oaks growing on 886 fifth-acre sample plots taken in southwestern Wisconsin and Houston County in southeastern Minnesota. Age was determined from increment borings taken at breast height. From 2 to 5 years were added to the age of each tree at breast height, depending upon the observer's best judgment of the effects of site and general early vigor of the tree as shown by the width of the annual rings. This gave an approximate total age from seed. Some foresters suggest using a greater age allowance to breast height because it has been observed in several localities that rabbits nip oak seedlings back repeatedly for as many as 10 or more years (*5*). However, there is no accurate way to determine such age differences.

Method of Analysis and Results of Study

As a preliminary step, the mean age of all dominant northern red oaks on each plot was computed. Upon the basis of these averages, 886 plots were separated into eight age classes, ranging from 20 years (16 to 25 inclusive) to 90 years (86 to 95). Then the number of years by which the ages of the main-stand trees varied from the average was determined for each plot. Subsequently, these data for individual plots were grouped by age classes and summarized.

The results of this study indicate that the northern red oak stands of the Lake States region are essentially even-aged. Between 54 and 88 percent of all stems were within 5 years of the mean age, and 81 to 100 percent were within 10 years of the mean age (Table 1). It is true that the spread in the age of dominants in mature stands commonly is 12 to 20 years and occasionally may be as much as 40 years. It is also fairly certain that the total variability in the age of main-stand trees would have been greater if,

TABLE 1.—DISTRIBUTION OF DOMINANT NORTHERN RED OAK IN ACCORDANCE WITH THE AMOUNT BY WHICH THE AGE[1] OF INDIVIDUAL TREES VARIES FROM THE MEAN

Deviation from mean stand age	Distribution of trees within following mean stand age group							
	20	30	40	50	60	70	80	90
Years				*Percent*				
Younger								
21+				0.5	0.4	0.6	1.3	1.6
16-20		1.1	0.4	3.5	0.8	1.6	1.9	1.5
11-15			1.6	4.9	3.1	2.5	2.1	0.8
6-10	5.3	6.7	13.2	13.8	13.2	13.0	10.2	11.5
1-5	32.0	31.1	36.0	20.8	29.7	27.4	33.2	37.7
Average	20.0	7.8	9.1	4.9	4.1	6.1	9.1	4.6
Older								
1-5	36.0	37.8	29.8	28.6	33.3	32.0	30.3	26.9
6-10	6.7	3.3	4.1	12.4	10.5	10.5	7.6	10.0
11-15		1.1	3.3	8.0	4.2	2.9	2.1	2.3
16-20		1.1	0.8	1.9	0.5	1.9	1.1	0.8
21+			1.7	0.7	0.2	1.5	1.1	2.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Basis:								
No. plots (886)	30	33	68	129	261	190	137	38
No. trees (3,091)	75	90	242	427	915	684	328	130

[1]Age throughout this paper refers to the total elapsed period since the trees became established as first-year seedlings.

TABLE 2.—RELATIONSHIP OF THE VARIABILITY IN THE AGE OF DOMINANTS IN NORTHERN RED OAK STANDS TO SITE QUALITY

Age class	Departure from mean age of main stand	Proportion of all dominants which are relatively even-aged for following site classes: All combined		Poor and very poor		Medium		Good and very good	
			Per-		Per-		Per-		Per
Years	*Percent*	*No.*	*cent*	*No.*	*cent*	*No.*	*cent*	*No.*	*cent*
70[1]	+11 and over	23	8.2	9	14.1	3	3.1	12	10.0
	+ 1 to 10	113	40.4	26	40.6	37	38.5	49	40.8
	0 (Mean)	17	6.1[3]	2	3.1	7	7.3	8	6.7
	− 1 to 10	100	35.7	18	28.1	43	44.8	39	32.5
	−11 and over	27	9.6	9	14.1	6	6.3	12	10.0
Total		280	100.0	64	100.0	96	100.0	120	100.0
80[2]	+11 and over	24	5.1	6	4.9	10	6.3	10	5.2
	+ 1 to 10	174	36.8	49	39.8	63	39.6	72	37.7
	0 (Mean)	47	9.9[3]	16	13.0	15	9.4	20	10.5
	− 1 to 10	212	44.8	49	39.8	66	41.5	83	43.5
	−11 and over	16	3.4	3	2.5	5	3.2	6	3.1
Total		473	100.0	123	100.0	159	100.0	191	100.0

[1]Based on 71 fifth-acre sample plots.
[2]Based on 119 fifth-acre sample plots.
[3]These averages are based on data from a smaller number (190 as compared to 827) of sample plots than are the means for the corresponding age classes in Table 1. This explains why the two sets of values do not agree.

instead of fifth-acre plots, larger, somewhat understocked sample areas had been used for the analysis. Nevertheless, the even-aged characteristic of these northern red oak stands seems predominant.

There was some question as to whether the age characteristics of the main stand would be the same on all sites. In order to determine this point, the site index was computed for 190 fifth-acre plots in the 70- and 80-year-old age classes, using the average-volume-of-dominants method (*2*).

In the 80-year-old stands approximately 80 percent of all dominants are within 10 percent of the mean stand age for each of the three site groups. Somewhat more variation between sites appears in the 70-year age group; only 69 percent of the dominants in poor sites versus 83 percent in medium sites are within 10 percent of the mean stand age. From these indications it would appear that there is little correlation between age variability and site (Table 2 and Fig. 1).

An analysis of sample plot data for only the relatively mature oak forests (those in the 60-, 70- and 80-year age classes) shows that from 27 to 34 percent of the trees of the main stand are more than 5 years older or younger than the mean age (Table 1). The remaining 66 to 73 percent are considered as even-aged. The distribution of this latter category of stems, in terms of the actual age of each tree, was computed for approximately 80 percent of the total number of sample plots in the foregoing age classes (Table 3). From the information thus obtained, it is evident that the regeneration which developed into the even-aged segment of the main stand in these older oak forests did not originate from one or two bumper acorn crops, but rather was the result of more or less continuous natural seeding during the entire 10-year period.

In a recent paper on the diameter growth rates of northern red oak (*6*), it was pointed out that northern red oak often occurs in more or less even-aged patches in otherwise pure stands of sugar maple and associated "climax" hardwoods. This indicates that this species of oak is more tolerant than commonly is believed. Curtis and McIntosh (*1*) reached essentially the same conclusion and used a numerical scale to measure the "ecologic adaptation" of the various deciduous trees. On this basis northern red oak rated 6.0 as compared to 1.0 for large-tooth and trembling aspen and 10.0 for sugar maple.

Apparently northern red oak, while too shade-sensitive to develop true all-aged stands of seedlings, saplings, poles, and saw timber, is sufficiently tolerant and aggressive to fill in any natural openings where overhead light is available. The analysis of age variability for the 886 sample plots studied seems to bear out this observation. An ecological history of the foregoing character might well account for the occurrence of the 145 older and younger-than-average trees which are present in the 80-year-old stands which came in concurrently with agricultural settlement (Table 4).

The fact that 27 of 100 dominant trees are 6 to 35 years older or younger than the average is silviculturally significant. Principally, it provides some assurance that

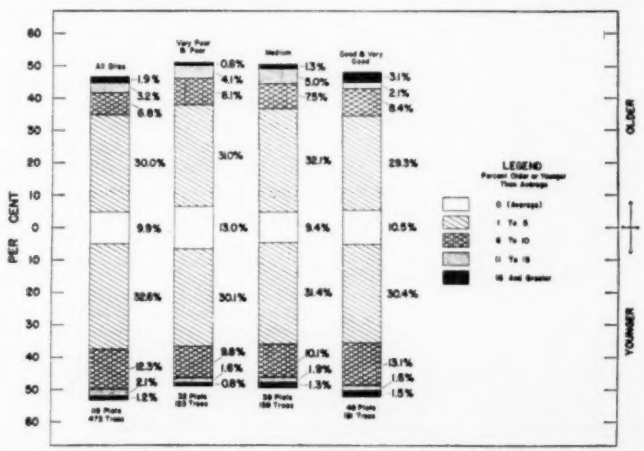


FIG. 1.—Relationship between site index and the variability in the age of dominant northern red oak for 80-year-old stands.

TABLE 3.—DISTRIBUTION OF EVEN-AGED, MAIN-STAND TREES, BY AGE, IN NORTHERN RED OAK FORESTS

60-year-old stands[1]			70-year-old stands[2]			80-year-old stands[3]		
Age	Trees	Proportion	Age	Trees	Proportion	Age	Trees	Proportion
Years	*No.*[4]	*Percent*[4]	*Years*	*No.*[4]	*Percent*[4]	*Years*	*No.*[4]	*Percent*[4]
56	27	5.2	63	37	13.0	76	16	4.3
57	32	6.1	64	12	4.2	77	29	7.8
58	33	6.3	65	29	10.2	78	35	9.5
59	97	18.6	66	36	12.7	79	41	11.1
60	34	6.5	67	22	7.8	80	49	13.2
61[5]	28	5.4	68[5]	25	8.8	81[5]	47	12.8
62	19	3.6	69	33	11.6	82	49	13.2
63	98	18.8	70	15	5.3	83	39	10.5
64	34	6.5	71	27	9.5	84	25	6.8
65	89	17.1	72	31	10.9	85	29	7.8
66	31	5.9	73	17	6.0	86	11	3.0
Total	522	100.0		284	100.0		370	100.0

[1]Based on 227 fifth-acre plots taken in LaCrosse County, Wisconsin, and Houston County, Minnesota.
[2]Based on 119 fifth-acre plots taken in LaCrosse County, Wisconsin, and Houston County, Minnesota.
[3]Based on 119 fifth-acre plots taken in southwestern Wisconsin.
[4]Both the total number of trees and the corresponding percentage equivalents refer only to even-aged stems of the main stand. This accounts for the fact that the percentage of trees of mean age, as shown here, differ substantially from those of Table 1.
[5]Mean for age class.

TABLE 4.—DIFFERENCES IN TOTAL AGES OF DOMINANT NORTHERN RED OAK IN 80-YEAR-OLD STANDS OF SEEDLING ORIGIN

Age group	*Number*	*Percent*
Mean (81 years)	48	9
1 to 5 years younger	175	33
1 to 5 years older	160	31
Even-aged trees	383	73
6 to 10 years younger	54	10
6 to 10 years older	40	8
11 to 15 years younger	11	2
11 to 15 years older	11	2
16 to 35 years younger	17	3
16 to 35 years older	12	2
Uneven-aged trees	145	27
Total	528	100

northern red oak gradually can reseed well-lighted openings left by partial cuttings. These operations might be in the nature of harvests by the shelterwood system or they might entail the clear cutting of strips or small blocks. In either case, the main objective would be to remove the merchantable timber in several stages. The total period required for these regeneration cuttings usually would be 20 to 30 years, depending on the age and condition of the stand.

In each operation, individual stems or groups of trees having the poorest quality or the least promise as crop or seed trees should be removed. Furthermore, logging would be done only in those years when there was a good crop of acorns. Scarification or other methods of working the seed into mineral soil might be necessary on areas where this was not accomplished as a result of felling and skidding. Stoeckeler recently observed the oak forests of both France and Germany. He reports (7) that it is the European practice to secure natural regeneration of *Q. petraea* (*sessiliflora*) by a series of thinnings, improvement cuttings, and shelterwood harvests which gradually reduce the stand to about 50 percent of its original volume and reserve only the highest-quality stems and elite seed trees for the final logging operations. It should be recognized, however, that *Q. petraea* is one of the white oak group which characteristically produces heavier crops of acorns at more frequent intervals than does *Q. borealis*. For this reason, as well as because of basic ecological and silvicultural differences between the two species, the problem of securing natural regeneration appears to be much more difficult in northern red oak stands than in the durmast oak forests of France and Germany.

Entirely on theoretical grounds, it appears that the regeneration history of the older stands of northern red oak was somewhat akin to the "shelterwood" system or "clear cutting" in small blocks. Again, using the basic data from the preceding tabulation (80-year class) and assuming no serious rabbit damage, one might speculate that the origin of these forests was about as follows:

Period in parent-stand history	Probable duration	Percentage of present-day dominants which came in during each period
	Years	
Ecological maturity attained	20	3
Individual trees die and overstory thins out	10	12
Mortality occurs at an accelerated rate	10	73
Overstory reduced to scattered dominants	10	10
Only an occasional seed tree left	20	2
Total	70	100

Summary

1.—Northern red oak (*Quercus borealis* Michx. f.) is the most important commercial timber tree of southern Wisconsin and southeastern Minnesota.

2.—In southern Wisconsin, where near-optimum growth is attained, this species accounts for about three-fourths of the board-foot volume of the mixed-oak type.

3.—Its typical occurrence in nearly pure stands which, individually, are quite uniform in density and height has led to the general conclusion that the dominant trees in such forests are even-aged. This viewpoint has been strengthened by the almost total absence of seedling, sapling, or pole-sized northern red oak trees in the understory, even in the older, fully protected tracts.

4.—This study substantiates the even-aged character of the main stand in pure or nearly pure forests of northern red oak. On the other hand, the maximum difference in the ages of the oldest and youngest dominants proved to be greater than commonly is appreciated. This spread amounts to one, two, or even three decades in the older forests.

5.—In fully stocked stands, this general age structure appears to be characteristic for the species in both immature and mature forests and apparently is not influenced by site.

6.—The fact that northern red

oak is sufficiently tolerant and aggressive to develop a main stand of somewhat variable age is silviculturally important. It suggests, among other things, that the species might be managed by some system, such as clear-cutting strips or small blocks or by the shelterwood method, which removes the merchantable timber in several stages rather than in a single operation.

Literature Cited

1. CURTIS, J. T. and R. P. MCINTOSH. 1950. The upland hardwoods continuum of southwestern Wisconsin. Bul. Ecol. Soc. Amer. 31:58. 1950 Abst.
2. GEVORKIANTZ, SUREN R. and HAROLD F. SCHOLZ. 1944. Determination of site quality in understory oak forests. Jour. Forestry 42:808-811.
3. ———, 1948. Timber yields and possible returns from the mixed-oak farmwoods of southwestern Wisconsin. Pub. No. 521, Wis. Dept. of Conserv.
4. KUNTZ, J. E. and A. J. RIKER. 1950. Oak wilt in Wisconsin. Stencil Bul. No. 9, Agric. Exp. Sta., Univ. of Wis., Madison.
5. LEOPOLD, ALDO. 1949. A sand county almanac. Oxford Univ. Press. 226 pp., illus.
6. SCHOLZ, HAROLD F. 1948. Diameter-growth studies of northern red oak and their possible silvicultural implications. Iowa State Coll. Jour. of Science 22(4):421-429.
7. STOECKELER, J. H. 1949. Observations in European forestry. Unpublished manuscript. Pp. 51-54, 74, and 76-77. Lake States Forest Exp. Sta., University Farm, St. Paul, Minn.

The Vegetation-Soil Survey in California and its Use in the Management of Wild Lands for Yield of Timber, Forage and Water

A. E. Wieslander and R. Earl Storie

Respectively; forest economist, California Forest and Range Experiment Station; and soil technologist, University of California, Berkeley.

FOR A NUMBER OF YEARS the California State Division of Forestry has wanted to know more about certain wild lands outside the national forests. These lands are in two localities: the coast ranges of northern California and the upper foothills of the west slope of the Sierra Nevada. They comprise about 10 million acres. In these areas the commingling of timber, grass, and brush lands is the cause of difficult land-use problems. There have been arguments for and against brush burning, and questions have arisen as to suitability of the lands for timber growing or grazing use, and as to the effect of these uses on watershed values. Hence there is much need for inventories of forests, other vegetation, and soil. This was recognized by the California Legislative Forest Study Committee when it recommended in its report to the state legislature in 1945 (*1*) that "... As soon as possible the State should undertake a study of land classification to determine factually which lands should be dedicated to timber growing, which to livestock raising, and which are too poor or unsatisfactory for either pursuit."

The opportunity to undertake such basis inventories was afforded in 1946 by the start of a federal forest survey in California. Upon recommendation of the State Board of Forestry, the 1947 Legislature appropriated funds for intensification of the federal survey in the areas of special state interest. This intensification comprises a combination of vegetation and soil mapping that is integrated with the federal project.

The Maps

The end products of this work are two series of blue-line print maps. The first series, called Timber Stand Maps, contains information on vegetation that can be obtained from aerial-photo study; the second series, called Vegetation-Soil Maps, contains information on both vegetation and soil that is obtained by field survey. Each map sheet is the size of a standard 7-$\frac{1}{2}$-minute quadrangle sheet and covers about 37,000 acres at a scale of 2 inches to the mile.

The Timber Stand and Vegetation-Soil Maps are prepared in five steps:

1.—The vegetation and other land features are classified and delineated on aerial photos (scale 1:20,000) by means of stereoscopic study. Timber croplands are distinguished from nontimber lands, and timber stands are classified by age-structure and density.

2.—The classification boundaries delineated on the aerial photos are transferred to base maps by means of a Kail planimetric plotter. (The base maps are specially prepared, mostly from published sources. They show exterior latitude and longitude lines, the land subdivision lines—sections, townships and ranges—main streams and roads, and other prominent landmarks.)

3.—The Timber Stand Maps containing the classification boundaries and symbols recorded in Step 1 are drafted for reproduction of blue-line prints.

4.—The aerial photos containing the classifications made in Step 1 are taken into the field. There the delineated areas are further classified through field observation and study, according to (a) species composition of the vegetation, (b) site quality of timber croplands, and (c) series and depth of soil.

5.—Vegetation-Soil Maps are prepared for reproduction of blue-line prints. This is done by redrafting the maps of Step 3 so that they include the symbols and other changes required for the classifications made in Step 4.

In this mapping, the smallest area delineated in aerial-photo study (Step 1) is 10 acres where differences are contrasting, and 40 acres where the differences are not contrasting. Forty acres is the smallest field subdivision (Step 4)

of a photo classification for contrasting species composition, soil condition, or timber site quality. Below minimum areas are entirely disregarded in the classification.

The Vegetation Classification

The classification of vegetation used in this mapping is an outgrowth, and an intensification, of an earlier project (*9*). In this earlier work, mapping was based upon field observations alone. The currently employed methods using aerial photos were first described by Wieslander and Wilson (*10*) and subsequently in more detail by Jensen (*5*).

As previously indicated, the classification of vegetation is divided between the Timber Stand and Vegetation-Soil Maps. The Timber Stand Maps show:

1.—Broad kinds of vegetational cover, such as commercial conifers, noncommercial conifers, hardwoods, chaparral, sagebrush, grass, and various mixtures of these. In the mixtures the order of the symbols indicates the relative abundance of constituent vegetation.

2.—Land features, such as cultivated, urban, marsh, and barren areas.

3.—Whether or not the areas can produce timber crops.

4.—The age-structure and densities of the commercial conifer stands.

5.—Whether hardwood stands consist predominantly of mature or immature trees.

6.—Whether or not the tree-covered nontimber lands have terrain favorable for harvesting the trees in the event they attain commercial value.

7.—The total density of the combined tree and shrub cover.

On the Timber Stand Maps the classification symbols consist of letters and numbers arranged in the form of a fraction. As illustrated in Figure 1*A*, one fractional set of symbols appears in each bounded area. The complete timber-stand legend is shown in Figure 2.[1]

On the Vegetation-Soil Maps the vegetation classification is designated by letter symbols as in Figure 1*B*. They show the dominant plant species (excluding grass and associated herbs) within

[1]Additional information about the timber stand and other classifications used in this survey can be obtained from a pictorial atlas folio (*2*) that has been prepared as an aid to the user of the Timber Stand and Vegetation-Soil Maps.

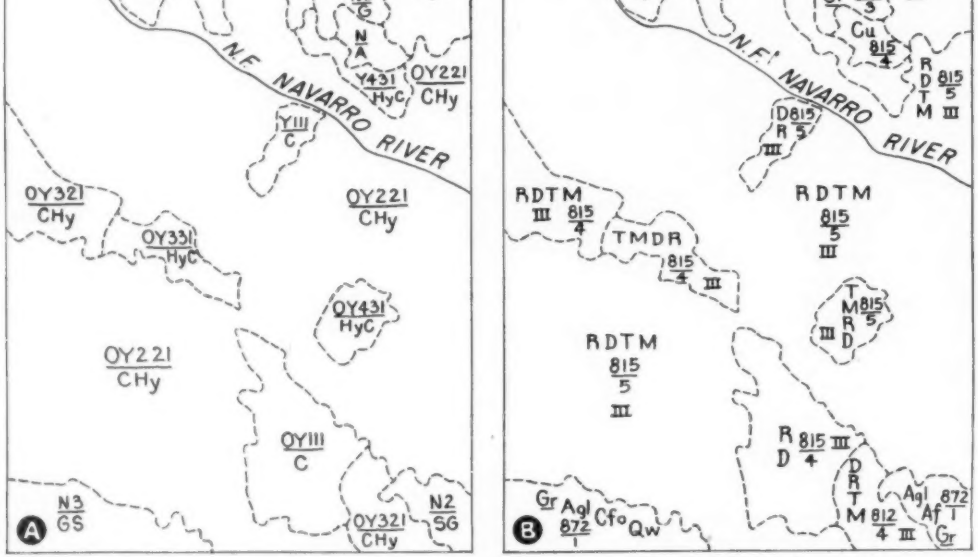


FIG. 1.—*A*—Section of a timber stand map. See Figure 2 for legend. *B*—Corresponding section of the vegetation-soil map. Legend follows:

Vegetation: D — *Pseudotsuga taxifolia* (Douglas fir), M — *Arbutus Menziesii* (Pacific madrone), R — *Sequoia sempervirens* (Coast redwood), T — *Lithocarpus densiflora* (Tanoak), Af — *Adenostoma fasciculatum* (Chamise), Agl — *Arctostaphylos glandulosa* (Eastwood manzanita), Cfo — *Ceanothus foliosus* (Wavyleaf ceanothus), Gr — Grass and other associated herbaceous species, Qw — *Quercus Wislizenii frutescens* (Scrub interior live oak).

Timber Site Quality: III — Site Index 140 for Douglas fir.

Soil: $\frac{812}{4}$ — Hugo series, depth class 4; $\frac{815}{4}$ — Josephine series, depth class 4; $\frac{815}{5}$ — Josephine series, depth class 5; $\frac{847}{3}$ — Laughlin series, depth class 3; $\frac{872}{1}$ — Maymen series, depth class 1.

Other land features: Cu — cultivated land.

each bounded area. By comparing *A* and *B* of Figure 1 it will be seen that in *B* one or more of these letter symbols have been substituted for each vegetation-element symbol in *A*. This means that each of the plants thus represented in *B* composes 20 percent or more of the cover formed by the vegetation-element in *A* to which it belongs. The order of symbols in a vegetation-element group indicates the relative abundance of the species.

Legend sheets that accompany each Vegetation-Soil Map unit include a table which lists the species symbols appearing on the map unit, and the common and scientific names. In addition, this table shows for each plant mapped its post-fire sprouting capacity — whether it sprouts or fails to sprout when its top is fire-killed. Also given for each plant species listed is its browse value as rated by Dr. A. W. Sampson of the University of California. These ratings, which are overall values that include sprouts after burning or cutting, are designated numerically: 1 — Excellent; 2 — Good; — 3 — Fair; 4 — Poor; and 5 — Negligible or none. Separate browse-value ratings are made for horses, cattle, sheep, goats, and deer.

The Timber Site Classification

The predominant site quality is designated for each timber cropland area shown on the Vegetation-Soil Map.

Timber types containing ponderosa or Jeffrey pine species are graded in terms of the total height that average dominant trees reach at 300 years of age, by 25-foot classes, according to Dunning (*4*). These classes are designated by Arabic numerals as follows:

Map symbol	Site index
1	75
2	100
3	125
4	150
5	175
6	200

Douglas-fir and redwood timber types are graded in terms of total height that the average dominant and codominant Douglas-fir trees reach at 100 years of age, by 30-foot classes, according to McArdle and Meyer (*6*). These classes are designated by Roman numerals as follows:

Map symbol	Site index
V	80
IV	110
III	140
II	170
I	200

The Soil Classification

Before soil mapping started in the Vegetation-Soil Survey, considerable preliminary work was done by the authors of this paper in determining the soil characteristics that are of sufficient importance to be included in the mapping program. This introductory work resulted in a suggested system of rating soils for timber growth (*8*). It was also valuable in working out a system of mapping soils in the field that would yield soils data of importance for timber, grass, and water production. The system also had to be workable by field men whose primary training had been in forestry rather than in soil science.

The soil characteristics considered are: Effective depth to bedrock (to hardpan or claypan), color of surface soil, type of parent material, texture of surface soil and subsoil horizons, permeability of soil profile, drainage, reaction of soil, and general topography. Most of these are characteristics that determine the soil series, which is the standard classification in use for soils throughout the United States and many countries of the world. Thus, the soil series is also considered the best mapping unit for wild-land soils. In the preliminary work noted above, it was found that the depth of a soil is highly significant for wild-land management purposes. The soil-mapping program was therefore set up on the basis of determining for each vegetational unit delineated (1) the predominant soil series and (2) its average depth.

The soil series is designated by the numerator of a fraction, for example, $\frac{812}{4}$. The first digit indicates the soil profile group to

FIG. 2.—Legend for timber stand maps.

which the soil belongs (for example, "8" for soils of upland areas developed on consolidated sedimentary rocks); and the last two digits, the soil series ("12" for Hugo series). When soil series are combined into what are termed the Great Soil Groups of the World there is shown a general relationship between vegetation, climate, and soil series (7). The following numbers are therefore set aside for the different groups of soil series:

Series Nos.	Great soil group	Characteristic vegetation
11 to 29	Podzolic	Timber
31 - 39	Prairie	Grassland
41 - 59	Noncalcic brown	Woodland grass
61 - 69	Chernozem	Grassland
71 - 79	Lithosols	Very shallow soils, often brush types
81 - 89	Sierozem	Desert
91 - 99	Rendzina	Grassland

The depth class is designated by the denominator of the fraction. Depth Class 1 is a very shallow soil less than 1 foot deep. Depth Class 2 is a shallow soil between 1 and 2 feet deep. Depth Class 3 consists of soils 2 to 3 feet deep. Depth Class 4 consists of soils 3 to 4 feet deep, and Depth Class 5 the deeper soils that are more than 4 feet deep.

As illustrated in Figure 1*B*, one soil symbol is placed in each vegetational unit of the Vegetation-Soil Map.

The legend sheets for soil data that accompany each map sheet include:

1.—A table which lists the soils mapped, by map symbol, series name, and the normal depth classes. This table also gives for each soil: The color and texture of surface soil, kind of parent material, reaction, and characteristic topography.

2.—A second table which shows for each soil and depth class mapped: (a) Permeability, based on estimated rate of movement of water, air, and roots through the soil profile. Relative terms used are permeable, slowly permeable, very slowly permeable. (b) Drainage-runoff. Drainage is an expression of the disposition of water applied to the surface of a soil. It either drains through the profile rapidly or slowly to a deep or shallow depth (internal drainage)—being affected by depth of soil and profile development; or drains off the surface (runoff)—being affected by topographic position. Relative terms used are excessive (for example soils on steep slopes); good; imperfect (soils having very slowly permeable subsoils); poor (soils having very slowly permeable subsoils occurring on flat topography). (c) Toxicity, expressed by such terms as extremely acid, very alkaline, serpentine. (d) Annual rainfall range, based upon best available isohyetal map. (e) Rating of suitability for timber. Relative terms used are very good, good, fair, poor, questionable, unsuited. (f) Rating of suitability for grass. Relative terms used are very good, good, fair, poor, very poor.

The information in this second table, for the map sheets so far completed, clearly brings out the relationship between timber and grass productivity ratings and some of the important characteristics of the soil series.

Deep alluvial soils occurring in the podzolic zone rate the highest for timber. Podzolic soils (for example, Hugo and Josephine series) that are more than 4 feet deep, of moderately acid reaction, permeable, well-drained, without a toxic condition, and in an area where annual rainfall exceeds 40 inches, rate high for timber. These same podzolic soils rate lower for timber where less deep and where annual rainfall is between 30 and 40 inches. Soils in the higher rainfall zones, but with less permeable profiles or shallower depth, also rate lower for timber. Soils less than 2 feet deep, those with imperfect drainage, or those with less than 30 inches of rainfall are usually unsuited for timber production.

Considering natural grass production, the depth and permeability seem less important, but the texture, lime content, and exchangeable bases of the soils are especially significant. Prairie soils (for example, Cayucos and Los Osos series) rate the highest for grass, followed closely by Chernozems (for example, Altamont and Diablo series) and the Rendzinas. The noncalcic brown soils (for example, Vallecitos, Vista, and Laughlin series) are usually of fair quality; the podzolic soils (for example, Hugo series) are of poor quality; and the shallow podzolic lithosols (for example, Maymen series) are of very poor quality.

The soil-series characteristics relating to hydrology and watershed management were explored in collaboration with P. B. Rowe of the California Forest and Range Experiment Station. The significant characteristics appear to be:

a.—Capacity of the soil to store water, including field capacity, the capacity at saturation, and the permanent wilting percentage.

b.—Permeability of the surface soil, subsoil, and parent material or upper parent rock.

c.—Water storage capacity of the parent material or upper parent rock.

d.—Erodibility of the soil under natural conditions.

e.—Permeability and erodibility of the soil under four different conditions of land use: (1) Cultivation, (2) grazing, (3) logging, (4) fire.

Estimates of these characteristics for each soil series and depth class can be made from information obtained in conjunction with the field mapping. It is planned to incorporate tabulations of such estimates in published reports covering completed county or other units of the survey. These reports will be supplemented by overall wild-land soil maps printed in color.

Map Uses

The degree to which the data presented on the Timber Stand and Vegetation-Soil maps can be used in land management is still in the process of development. An important step in this development was a 5-day field meeting held during October 1950. The purpose of the meeting was to make the maps better known to representatives of federal, state, and county land-management agencies, and through them to forest and other wild-land

owners. There were 42 people present, including foresters, range technicians, agronomists, hydrologists, soil scientists, and land appraisers, representing practically every public agency concerned with the problems of the area.

The meeting had two parts. The first acquainted the group with the maps—how they are made, what they show, the mapping intensity, and limitations. This was accomplished by means of classroom and field demonstrations. The second part consisted of committee meetings in which were developed some possibilities in using the maps as working tools in land management and related activities. A summary from the committee reports (*3*) is presented below:

Forest management uses. — The committee that considered forest management uses recognized that the maps provide much basic information usable in preparing management plans, and in implementing certain management activities. Its report pointed out among other uses that the map data would aid the forest manager:

1.—In determining the suitability of the land in question for forest management.

2.—In facilitating and reducing the cost of timber volume and growth inventories.

3.—In planning cutting methods and other silvicultural treatments.

4.—In the preparation of logging plans as may be determined by the character of the timber stand and the underlying soil.

5.—In making and executing a fire control plan.

6.—In determining what areas are in need of restocking, and in setting up priorities for planting and other regeneration measures so that best quality lands can be treated first.

Range management uses. — The committee listed the following major applications of the maps to range use:

1.—They will provide a basic record of the species and patterns of vegetation for reference in the future.

2.—They will help in analysis of requests for agricultural improvements and developments.

3.—They will help in the evaluation of range soils and sites, and in the formulation of range plans.

4.—They will provide a sounder basis for advice on proposed range improvements.

5.—They will help in present wildlife research and management.

6.—They will help in making fire plans for controlled burns.

Watershed management uses. — The committee defined watershed management as "the administration of a drainage area for flood and erosion control, and the production of maximum usable water." The committee reported that the quality and type of basic vegetation and soil information obtained will prove useful in the determination and control of many watershed management problems. Specifically, the report suggested that the map data, though usually inadequate alone, would be helpful in:

1.—Determining index to soil stability and the sedimentation potential.

2. — Determining comparative erosion rates, peak flows, and water yield.

3.—Planning road construction and logging operations as they affect runoff and erosion.

4.—Cost and time scheduling of reservoir and right-of-way clearing and maintenance.

5. — Planning land-management programs around reservoirs and other developed features.

6. — Preparing programs of organized land-use groups.

7. — Determining watershed behavior and influences of various existing watershed practices on this behavior.

8. — Predicting watershed behavior under various proposed circumstances.

Other uses.—A fourth committee reported that the maps would be helpful:

1. — In making wild land appraisals for taxation purposes and for bank and insurance loans.

2.—In planning recreational development in wild land areas.

3.—In planning the location of highways and power and communication lines.

4.—In planning by the military authorities for the defense of the coast against possible invasion. Information on kind and density of vegetation is important because the vegetational cover may (a) facilitate or impede movement of troops and mechanized equipment, (b) accentuate or conceal evidence of military activity, (c) affect the ease with which clearings can be made for the construction of roads and airfields, (d) serve as a source of construction materials and fuel. Information on soil also is important in assessing military trafficability and in estimating the suitability of various areas for airfield and road construction.

5. — In furnishing information of use in practically all phases of research on the problems of wild lands. The maps facilitate and encourage fundamental studies of plant-soil relationships. By providing a sound basis for stratification they enable the use of efficient statistical techniques in many research projects. They provide information on use patterns and resources prerequisite to many studies in forest and land economies.

6.—In contributing to the basic soil classification and mapping programs of the state and of the United States. Soil classification of more detailed intensity than shown on the maps does not seem warranted for wild lands at the present time, but the maps provide a sound basis for, and would be of particular help in, more detailed mapping of certain areas when the need arises.

The maps were being used by many people even before this field meeting. This was evident by the sale of more than 5000 map sheets since the announcement of their availability for purchase at the cost of printing. This strong demand for published maps together with the many uses suggested by men at the field meeting would seem to indicate that the maps should be an important factor in the planning and execution of wild land management in California.

Literature Cited

1. CALIFORNIA FOREST STUDY COMMITTEE. 1945. The forest situation in California. (Report to the Legislature by the California Forestry Study Committee Created by Chapter 1086, Statutes of 1943.) Calif. State Print. Off.
2. CALIFORNIA FOREST AND RANGE EXPERIMENT STATION AND STATE DIVISION OF FORESTRY. 1949. The timber stand and vegetation soil maps of California. (A series of maps prepared by the Forest Survey Staff, Division of Forest Economics, for the State Division of Forestry.)
3. CALIFORNIA STATE DIVISION OF FORESTRY. 1950. Report on the Howard Forest Training School.
4. DUNNING, DUNCAN. 1942. A site classification for the mixed-conifer selection forests of the Sierra Nevada. Research Note No. 28. Calif. Forest and Range Exp. Sta., Berkeley.
5. JENSEN, HERBERT A. 1947. A system for classifying vegetation in California. California Fish and Game 33(4): 199-266.
6. MCARDLE, RICHARD E. and WALTER H. MEYER. 1949. The yield of Douglas-fir in the Pacific Northwest. U. S. Dept. Agric. Tech. Bul. 201, 1930, rev. Oct. 1949.
7. STORIE, R. EARL. 1947. Legend—soil classification, forest inventory. (mimeographed).
8. ———— and A. E. WIESLANDER. 1948. Rating soils for timber sites. Soil Science Society of America Proceedings 13: 499-509.
9. WIESLANDER, A. E. 1935. First steps of the forest survey in California. Jour. Forestry 33(10): 877-884.
10. ———— and R. C. WILSON. 1942. Classifying forest and other vegetation from air photographs. Photogrammetric Engineering 8(3): 203-215.

Production of Naval Stores in Les Landes, France

John M. Fenley
University of Nevada, Extension Service.

From July 1945 to April 1946 the author was assigned as instructor in forestry and range management at the U. S. Army's Biarritz American University in southwestern France. In cooperation with Louis Barriety of the French Waters and Forests Service, field trips were made to inspect many phases of French forestry. The story here presented covers trips to Les Landes to study pine tapping practices, and is the fourth article in a series by the author on French forestry and range management.[1]

FEW FOREST REGIONS of Europe have as interesting and colorful histories as has Les Landes, France. Occupying for the most part former waste swampland fringed with shifting sand dunes, this forested region produces approximately one-third of the world's supply of turpentine and rosin.

Previous to World War II and the German occupation of France, about half of Les Landes' resin products was exported to Austria, Czechoslovakia, England, Germany, Italy, and the Netherlands. It was used in these countries in paint and varnish manufacture, as a commercial thinner, and in various industrial processes. The other half was absorbed by domestic French industry.

During the years of World War II, France was deprived of revenue from foreign sales of its naval stores. Furthermore, its own industries, severely damaged in the course of battle, suffered another setback by raw material shortage, including rosin and turpentine. Instead, the entire naval stores output was diverted to Germany, and used by I. G. Farben controlled industries in manufacture of munitions. Immediately after liberation of France, the total production was retained for domestic use to bolster French manufacture of soap and fine cut glass, and as a filler in wood paper pulp. In recent years, as European economy has turned for the better, once again Landes naval stores are finding a market in neighboring countries.

Topography and History

Les Landes as a forested area owes its existence to the originator of sand dune control, the French forester-engineer Bremontier. This astute and far-sighted man of the forest formulated methods of dune halting and stabilization from 1787 to 1817. His methods are still in use today.

Dunes form on the coastline as millions of tons of fine sand are washed ashore every year. Sand is carried down from the Pyrenees Mountains by the Garonne River, emptied into the Bay of Biscay to be swept south by an ocean current. Tide action and wave breakers continually place on the beaches enormous quantities of sand which form the dunes. Formerly the coastal line of dunes created a barrier to drainage of the inland areas. Over the centuries the undrained land became saline swamps.

Bremontier, after careful study, realized that successful reclamation of the huge area hinged on two main activities: drainage of swamps and halting of dunes before they were blown inland by prevailing easterly winds.

Swampland drainage was achieved by cutting channels through the coastal line of dunes and allowing the brackish water to flow seaward. Control of dunes was more difficult and necessitated the division of Les Landes into three zones. Remaining essentially the same since their inception, these zones are Littoral Dune, where the first steps of sand movement control are practiced; Littoral Zone, a strip of protective forest land 2½ miles wide paralleling the coast to function as a buffer for the interior; and Commercial Zone, or interior, occupying the remainder of Les Landes, about 2¼ million acres.

Dune control must begin in the fresh sand as it is washed ashore.

[1] Earlier articles: Forestry program of Biarritz American University, France. Jour. Forestry 46:368-71, 1948. Sand dune control in Les Landes, France. Jour. Forestry 46:514-19, 1948. Pollarding—age-old practice permits grazing in Pays Basque forests. Jour. Range Mgmt. 3: 316-18, 1950.

This is accomplished by the construction of interwoven brush fences, *cordon tresses*, to cause the wind to drop its load of sand. The next step is to hold the sand where it drops. For that purpose European beachgrass (*Ammophila arenaria*) is planted in staggered rows on the dune. Once the sand has been stabilized, it is possible to replace the beachgrass with brushy vegetation, for which broomsedge (*Sarathamnus scoparius*) and European gorse (*Ulex europaeus*), two leguminous shrubs, are planted.

Finally, behind the shrubby area, conditions are right for a forest canopy. Maritime or pinaster pine (*Pinus pinaster*) is well adapted and is the principle forest species of the region.

Silviculture and Resin

Pines of Les Landes are grown in pure even-aged stands. As in other forests of France, stands are divided into compartments, ranging from 15 to 40 acres. A different age class is represented in each compartment, and managed as a separate unit.

Silviculture first begins when a compartment reaches 8 years of stand age. At this time a thinning is made, and the French Forest Service, by selling removed saplings for firewood, regains labor costs. A second and final thinning is made at 18 years, when the trees removed are utilized as mine timbers or for pulp wood. After thinning is completed, the stands have approximately 180 trees per acre.

At about 20 years of stand age the trees are pruned to a height of 8 to 10 feet above the ground. Clear boles will develop; later when tapping begins, pitch faces will be free of knots.

Minimum size of trees for tapping is normally 13 inches (105 cm.) diameter at breast height. Although ages vary from time to time, the usual stand age is 36 years when trees are first brought into production. During wars and in other periods when demand for turpentine and rosin is above normal, trees may be brought in as young as 25 years. Conversely, when need is below normal, stands may be allowed to reach 40 or 50 years before being tapped.

FIG. 1.—Pitch face operations watched by group of forestry personnel from Biarritz American University. Operator is demonstrating the scraping of bark and the cutting of the pitch producing face. French turpentining practices are unique in the maritime pine forests of Les Landes. Author is at extreme right, standing.

Tapping lasts for 32 years, after which stands are felled by clear-cut logging. Age at logging is usually 68 years, but varies from 57 to around 80 if deviations from the normal are made.

Newly cut compartments are quick to cover with copious maritime pine reproduction, even though no seed trees are left after logging. Seeds remain dormant for several years in the forest mulch, and will germinate when the canopy is removed. Unopened cones in the trees are dislodged and broken during felling operations, and often release large quantities of viable seed. It is fortunate that artificial plantings are generally not necessary, for transplanting maritime pine is difficult. Transplant stock has unusually long tap roots. High mortality results when roots are clipped or damaged.

Tapping and Pitch

In any compartment to be brought into pitch production, a pre-tapping operation is performed in the spring before sap movement begins. Outer bark is scraped from a strip on each tree about 6 inches (15 cm.) wide, extending to about 3 feet (1 m.) above ground level. This prevents bits of loose bark falling into the pitch during the tapping season.

Pitch production most often starts on the east face of each tree. Throughout the entire tapping program of the compartment, all trees are kept at exactly the same phase of operation. An advantage other than uniformity is the operator need carry a minimum of tools to perform his work (Fig. 1).

When sap begins to flow, scraping is begun at ground level on the first face. A strip about 3½ inches (9 cm.) wide and 5½ inches (12 cm.) high is cut through the bark and cambium into two or three yearly rings of sapwood. Driven into the tree at the bottom of the face is a metal spile. Ground litter is dug away so that the earthen pot used to catch pitch can be set into position under the spile.

Each week the face is lengthened upward by about an inch (2 to 3 cm.), always keeping the width constant, until by the end of the first season the face is approximately 22 inches (55 cm.) high.

Six times during the season, pots are emptied of pitch. A seventh collection is made after the sap stops flowing when the dried pitch, called

barras, is scraped from the entire face.

The second year before the sap begins to flow, outer bark of the first face is scraped to a total height of 59 inches (150 cm.). When flow begins the spile is moved to the top of the face cut the first year. A nail is driven into the wood below the spile, the earthen pot held between the nail and the spile.

Procedures as described for the first year are here repeated, until at the end of the second year the face is 43 inches (110 cm.) high. For the third year, bark is scraped to about 98 inches (250 cm.) and the face cut to about 79 inches (200 cm.). During the fourth year, bark is scraped to about 128 inches (325 cm.) and the face extended to about 118 inches (300 cm.).

Tapping has then reached the fourth year, and is finished for the first face, making the first cycle one-quarter complete.

The second face is begun on the north side of the tree and for 4 years is tapped in the same manner as was the first face. West and south sides are then tapped in succession, each for 4 years. The first cycle is then completed. Four faces have been tapped in cardinal directions around the tree. As each face requires 4 years, the first cycle of pitch production has taken 16 years.

For the second cycle, the first face is cut halfway between the two oldest faces of the first cycle. The second, third, and fourth faces follow in succession, each tapped for 4 years exactly as were faces of the first cycle. This cycle ends the pitch production period, the tree having been tapped on 8 faces for a total of 32 years.

Production of pitch per year per tree is nearly constant throughout the tapping period for any one locality. Rates of production for localities vary, however, from about 2 quarts per tree per year near the coast to about 1 quart in the interior. The first pitch collection of the year always contains the highest percentage of turpentine and the clearest rosin. Each collection thereafter contains less turpentine and darker rosin, until the scrapings of *barras* of the seventh collection contain little or no turpentine and a nearly black grade of rosin.

FIG. 2.—Earthen pot for resin collection is held on pitch face between metal spile above and nail driven into tree below.

Toward the end of the production period, trees may be "tapped to death." By cutting faces wherever possible—as many as seven or eight faces producing simultaneously per tree were noted—pitch production can be greatly increased. This practice is attempted only during the last 3 or 4 years of the period, for trees are nearly girdled and are soon to die.

Turpentine and Rosin

When earthen pots are emptied during the collecting season, pitch is stored in half sunken concrete pits located in the forest. Later the pitch is placed in moss-calked barrels and transported by mule cart to the turpentine still.

Once at the still a relatively simple process is used to reduce pitch to turpentine and rosin. Sodium carbonate is added to pitch at the rate of 1.5 pounds (700 grams) per barrel. The pitch is stirred vigorously and heated to 203 degrees F. (95 C.) for a few minutes. After agitation ceases, impurities—bark, pine needles, bits of wood that were mixed in the pitch as it came from the forest—settle to the bottom. A viscuous fluid, called turpentine paste, is decanted from the vat into distillation tanks.

At high pressure within a distillation tank, and at a temperature near 400 degrees F. (200 C.), vaporization takes place for 20 minutes. Vapor, as it is given off, is forced through a chilled coil system where condensation occurs. The resulting liquid is crystal clear and contains approximately equal quantities of water and turpentine. Separation is accomplished by allowing the stream to flow into a stilling tank, where movement is reduced. Because of the difference in specific gravities, turpentine rises above the water.

After vaporization has driven off turpentine and moisture, pure rosin remains as residue in the distillation tank. It pours easily and is drained off to cool and harden.

Clearer grades bring better prices, and rosin is often bleached to take such advantage. For this, rosin is poured into flat circular molds and placed outdoors for about 30 days. Action of sunlight and rainwater lighten the color of rosin through 2 to 4 of the 15 grades.

During the latter parts of the collection season, pitch is dark and of poor quality. No attempt is made to bleach the dark rosin it produces, as a ready industrial market will absorb it. Instead it is poured directly into barrels from the distillation tank. To insure proper cooling and to prevent cracks and bubbles forming in the rosin, several barrels are filled simultaneously, a bucketful to each at a time.

Lumber from Turpentined Trees

Contrary to popular belief, lumber from the butt log of a chipped tree has higher value than that from trees not having been tapped. Turpentined wood is dark, hard, and dense. It generally has intricate marbling lines between annual growth rings. Because of early pruning, there are no knots to reduce amount of clear grain wood.

Dark colored lumber from turpentined trees is sold at premium prices. Most of its uses are for inlaid chess and checker boards, specialty furniture, and for ornamental purposes in building decoration.

An Approach to Density Measurement in Douglas-Fir

Philip A. Briegleb
Pacific Northwest Forest and Range Experiment Station, Portland, Oreg.

Most American yield tables are based on natural stands that have always been dense or overdense. Most European yield tables are based on stands that were dense at establishment and were given the benefit of frequent thinnings starting at an early age. Neither of these patterns of stand history applies or is likely to apply for many years to most young stands in the Douglas-fir region. The author proposes an approach to density measurement applicable to stands having highly variable histories. The basic data are taken from intensively managed Douglas-fir in Denmark and Prussia and from both thinned and natural stands in the Douglas-fir region of western Washington. Some of the relationships found may apply in principle to other species growing in even-aged stands.

EVERY FORESTER in the Douglas-fir region is keenly aware of a tremendous new interest in second growth. Cutting of young timber, negligible a few decades ago, now rivals logging of old growth in area covered each year. Sharp increases in stumpage prices have given added incentive to foresters striving to obtain maximum yields from the lands they manage.

These efforts are seriously handicapped by the lack of sound information on the levels of growing stock that should be maintained to achieve high productivity. Moreover, the yardsticks now available to foresters do not appear to give a satisfactory measure of the stand density or growing stock levels that are being maintained. Background information from intensive management of Douglas-fir in its native habitat is limited. Few test plots, on which detailed records have been kept, have been thinned more than once, and on none of these does the record cover as much as two decades. Some fairly comprehensive experimental thinnings have been made during the past 4 years. These give promise of yielding, in time, a strong background of basic information. In the meanwhile, cuttings in young Douglas-fir continue to accelerate. The foresters and woodsmen who direct the operations urgently need better guides to sound growing-stock objectives.

Preliminary guidance, to serve until the results of our own research installations accumulate, may be found in the records of Douglas-fir management in Denmark (*10, 19*). As early as the 1880's the Danes were planting Douglas-fir. Their management practices have been intensive. They selected their seed with care, striving to obtain only that from the best trees in the best stands growing in a climate comparable to that of the planting sites. By Pacific Northwest standards, the trees were planted at close spacings—some as close as 1 meter. First thinnings were made at age 15 to 20 years; later thinnings followed at intervals of 2 to 5 years, the interval lengthening as age advanced. The cuttings were, for the most part, an intensive application of the crown thinning method (*10*). In most thinnings the trees removed averaged a fraction of an inch smaller in diameter than the average diameter of the stand before thinning.

The life histories of seven Danish and one Prussian Douglas-fir stands, together with growth records of 16 permanent sample plots in western Washington, have recently been analyzed to obtain information on the results of maintaining different levels of growing stock. The experimental plots are on lands that rate from better-than-average site III to poorer-than-average site IV according to the Pacific Northwest classification (*13*). The growth records cover 3 to 6 decades for the European stands and 5 or 6 years for the native stands. The author is deeply indebted to O. Marstrand Jørgensen, Flemming Juncker, and to Erik Holmsgaard, Danish foresters, for help in interpreting the basic data on Douglas-fir in Denmark.

Yields obtained by the Danes have been very high. They have exceeded the normal rate of growth for natural stands of the same age and site, as indicated by our yield tables, by from 30 to more than 70 percent. The increment of managed Douglas-fir in Prussia has also been high. Thus, the growing-stock levels maintained in Europe should be significant.

Growing Stock in Danish Douglas-fir

The yardstick provided by the Douglas-fir site-age yield table based on natural stands (*13*) did not give a consistent measure of the growing stock maintained on the Danish plots. At ages of 20 to 30 years, cubic-foot volume in Denmark amounted to 110 to 150 percent of the yield-table normal. The number of trees retained after each thinning amounted to about 50 to 100 percent of the corresponding normal, but tree diameters averaged 10 to 40 percent greater. By age 50 to 60 years, cubic-foot volume had dropped to about two-thirds of the natural-stand normal, and the numbers of trees remaining at these ages represented only about 20 to 25 percent of normal. Tree diameters, however, averaged about 170 percent or so of yield-table normal.

Measured by stand-density index, or the number of trees per acre for average tree diameter (*13, 17*), Danish growing stock also varied greatly. In stands averaging 4 to 5 inches in tree diameter, from 85 to 105 percent of the natural-stand normal for the corresponding average d.b.h. was maintained. Stands averaging 15 to 18 inches d.b.h. had only 40 to 60 percent of normal.

Spacing in terms of tree height (*8, 18*) has been proposed as a relatively stable measure of desir-

able density, but in the Danish stands this measure likewise varied widely. When stand height was 30 feet, spacing averaged about one-seventh of height. In stands 90 to 100 feet high, spacing had widened to about one-quarter of average height.

Nor did bole area per acre, developed by Lexen (*12*) as a measure of growing stock, remain constant during the period covered by the Danish record. For example, in stands averaging 4 inches in diameter, bole area per acre totaled about 29,000 square feet; at average d.b.h. of 18 inches, bole area per acre had dropped to 14,000 square feet.

As age advanced and stand size increased, the Danish growing stock—measured by any of these standards—dropped below the level that most foresters in the Douglas-fir region would consider prudent. Experience has shown, for example, that a 50- or 60-percent cut in dense, previously unthinned Douglas-fir is likely to reduce growth greatly and to increase mortality through too abrupt reduction of growing stock and severe overexposure of the remaining stand. But the Danes have shown that increment can be maintained at a high level with reduced growing stocks, if that reduction is made gradually, by a series of light to moderate thinnings.

This leads us to suspect that there are systematic differences between trees of the same age, diameter, or height in well-managed stands and in dense natural stands. Evidence of a marked difference in height-diameter ratio is given in Figure 1. Trees in thinned stands average shorter than trees of like diameter in dense natural stands. Conversely, it was found that trees of a given height average larger in diameter in thinned stands than in dense natural stands. Presumably this is because thinning stimulates diameter growth more than it does height growth. The data for natural stands in Figure 1 are those used in compilation of the normal yield tables (*13*); those for thinned stands are from the Danish sample-plot records. Each weight represents a stand average at time of measurement. It is significant that at the smallest stand sizes there is little or no difference between the curves for the Danish and the native Douglas-fir. In the larger sizes the managed stands have had the benefit of numerous thinnings, and the trees in these stands differ greatly in height-diameter ratio from those in dense natural stands.

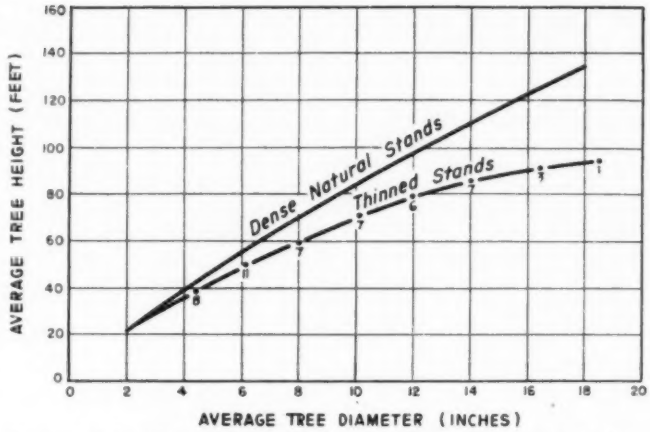


FIG. 1.—Relation of average tree height to average tree diameter in natural dense stands of Douglas-fir and in intensively managed Danish plantations of Douglas-fir.

Why can trees having a relatively low height for a given diameter apparently utilize more growing space than trees of the same diameter that are taller? Why can trees that are large in diameter for a given height use so much space? Presuming that trees with larger crowns can utilize more growing space, an obvious hypothesis is that for trees of a given diameter, the shorter trees have larger crowns than the taller; for trees of a given height those with the greater diameter have the larger crowns.

Crown Size Related to Tree Diameter and Height

This hypothesis was tested by taking a series of crown and other tree-dimension measurements at Wind River Experimental Forest during the summer of 1950. The Douglas-fir sampled ranged in age from 15 to 110 years, in stocking from very poorly to densely stocked, and included sites II-, III, and IV+. Results of the analysis of these data are summarized in Equations I and II:

I.

$$\left.\begin{matrix}\text{Crown width}\\ \text{in feet}\end{matrix}\right\} = 5.88 + 1.47 \left\{\begin{matrix}\text{D.b.h. in}\\ \text{inches}\end{matrix}\right\} - 0.133 \left\{\begin{matrix}\text{Tree height}\\ \text{in feet}\end{matrix}\right\}$$

II.

$$\left.\begin{matrix}\text{Crown length}\\ \text{in feet}\end{matrix}\right\} = 12.0 + 3.63 \left\{\begin{matrix}\text{D.b.h. in}\\ \text{inches}\end{matrix}\right\} - 0.184 \left\{\begin{matrix}\text{Tree height}\\ \text{in feet}\end{matrix}\right\}$$

These two equations give substance to the hypothesis that crown size in young Douglas-fir is related to both tree d.b.h. and tree height. The respective multiple correlation coefficients are 0.91 and 0.84. Both are significant at odds of 99 to 1, as are all four regression coefficients. Similar relationships between crown diameter and tree d.b.h. and height have been found by Ilvessalo (*11*) working with Scotch pine and Norway spruce in Finland.

Height at a Given Diameter a Factor in Density

From this evidence we may further reason that stands having a specified average d.b.h. will require fewer short trees than tall ones to stock an acre adequately. Such a relationship was found to exist in Danish and in western Washington stands, all of which had made good to excellent growth. For example, consider three Douglas-fir stands, all on land of site quality

FIG. 2.—Three contrasting Douglas-fir stands after thinning. See Table 1 for descriptions. (Average stem dimensions, crown dimensions, and spacing all drawn at same scale.)

III. They have had very contrasting histories, as can be seen by the stand profiles (Fig. 2). Stocking, in terms of most measures, varies widely (Table 1). But Danish and Douglas-fir region experience indicates that the densities of all three stands are at rather desirable levels *in view of the previous stand history of each.*

Stand A (Fig. 2) represents a typical 35-year-old stand of Douglas-fir in Denmark. It was first thinned at age 20 years; the sixth thinning has just been completed. All have been light to moderate thinnings. This treatment has resulted in an average d.b.h. of 10 inches and an average height of 60 feet. Crowns average 12.6 feet in width and 37.3 feet in length. Spacing averages 14.6 feet. In contrast is Stand B, which represents a Douglas-fir forest in the Pacific Northwest that grew overdense to age 55 years. It has just been lightly thinned for the first time to what is believed to be a desirable density. D.b.h. averages 10 inches, the same as in A. Height, however, averages 90 feet in contrast to only 60 feet. Average d.b.h. is the same in B as in A, but the crowns in B are both narrower and shorter than those in A. The live crowns extend along 35 percent of the total stem length in Stand B. This is common in many crowded stands in the Douglas-fir region. In contrast, the live crowns in Stand A cover 62 percent of total stem length.

Stand C represents a typical 55-year-old stand of Douglas-fir in Denmark, such as Stand A is likely to be 20 years hence. The twelfth thinning has just been completed in Stand C. It is similar in height to B, which is also 55 years old, but tree diameters average 75 percent larger. Contrasts in crown length and crown width are striking and obvious.

Number of trees per acre, basal area, volume, bole area, and stand intensity all vary widely for the three stands (Table 1). *Stand intensity* is stem volume in cubic feet divided by average stand height (*14*). *Crown projection* per acre is the area of the projections of the crowns upon a horizontal plane. *Crown surface* is the area of the surface of a paraboloid the diameter of whose base is equal to crown width and whose altitude is equal to crown length. Crown projection and crown surface area are probably related to what Baker (*2*) refers to as "photosynthetic area" and thus to tree growth. Crown projection and crown surface areas per acre in Stands A, B, and C are more stable than are the other density measures that were computed. Crown projection and crown surface are not easily measured directly, but the evidence indicates that they are related to stand variables—number of trees, average d.b.h., and height—which are easily determined. It may then be reasoned that number of trees,

TABLE 1.—DENSITY, BY VARIOUS MEASURES, OF THREE CONTRASTING DOUGLAS-FIR STANDS AFTER THINNING

Measure	Stand A First thinned at age 20 yrs., 6th thinning just completed at age 35 yrs.	Stand B Overdense to age 55 yrs., first thinning just completed at that age	Stand C First thinned at age 20 yrs., 12th thinning just completed at age 55 yrs.
Av. d.b.h. (In.)	10	10	17.5
Av. height (Ft.)	60	90	93
Av. crown width (Ft.)	12.6	8.6	19.2
Av. space between trees (Ft.)	14.6	10.8	22.6
Av. crown length (Ft.)	37.3	31.7	58.4
Density (per-acre basis)			
No. of trees	206	372	85
Basal area (Sq.ft.)	112	203	142
Volume			
Cubic feet (M. cu. ft.)	2.9	7.9	4.9
Scribner (M. bd. ft.)	6.4	17.3	23.5
Inter. ¼ (M. bd. ft.)	9.8	26.6	34.0
Bole area (M. sq. ft.)	17.7	47.8	13.8
Stand intensity (sq. ft.)	48	88	53
Crown projection (M. sq.ft.)	25.7	21.6	24.6
Crown surface (M. sq. ft.)	304	319	299

average d.b.h., and height are likely to be related to photosynthetic area and thus to tree growth.

A New Measure of Stand Density

The next step was to study the numbers of trees per acre found in managed Douglas-fir stands in Denmark, Prussia, and in both thinned and natural stands in the Pacific Northwest judged to be at least reasonably well stocked. A total of 55 stand measurements on 7 Danish permanent sample plots, 6 on one Prussian plot, and 32 on 16 western Washington plots were available for analysis. Eleven of the Washington plots had been carefully thinned; 5 were check plots in adjacent unthinned natural stands. The stands studied ranged in age from 18 to 70 years and in site from poor class IV to better than average class III.

The principal result of this study is summarized in Equation III:

III.

$$\left\{\begin{array}{c}\text{No. of trees as percent}\\ \text{of normal for av. d.b.h.}\end{array}\right\} = -34.62 + 1.245 \left\{\begin{array}{c}\text{Stand ht. as percent of}\\ \text{normal ht. for av. d.b.h.}\end{array}\right\}$$

The normal number of trees and normal height for Douglas-fir stands of specified average d.b.h. are as defined by Bruce (*13*). Height of the stands sampled ranged from 69 to 104 percent of normal for average d.b.h. Graphical tests indicate Equation III applies within this range.

If we assume that the high yielding European stands and the Pacific Northwest stands that have made comparable growth were reasonably well stocked, then Equation III indicates that for a stand of a given average d.b.h., more tall than short trees are required to stock an acre. As shown in Figure 1, Table 1, and in Equations I and II, presumably this is because the shorter trees tend to have larger crowns and the capacity to utilize more growing space. Gevorkiantz has previously described some of the relationships between stand density and the height-diameter ratio (*7*). The hypothesis added here is that a tree's capacity to use space is also related to its height at any specified diameter.

The correlation coefficient for Equation III is 0.59 and is significant at odds of 99 to 1. Departures from the regression defined by Equation III represent variations in stand density deliberately effected by the experimental thinnings and by the inclusion of unthinned check plots in the sample.

The new standard of growing stock is derived by applying Equation III to Bruce's stand-density normal for natural stands. The result is given in Table 2. This table shows numbers of trees per acre by average d.b.h. and by average height. Corresponding growing stock is shown in terms of basal area in Table 3 and is expressed as average radius of growing space in Table 4.

TABLE 2.—STANDARD NUMBER OF TREES PER ACRE BY AVERAGE DIAMETER AND AVERAGE HEIGHT

Av. d.b.h.	Average stand height, feet													Av. d.b.h.
	30	40	50	60	70	80	90	100	110	120	130	140	150	160	
Inches	*Number of trees*														*Inches*
4	935	1425	1912												4
5	486	773	1061												5
6		457	643	828											6
7		294	423	553	682										7
8			292	386	480	575									8
9			207	278	350	422									9
10				206	261	317	372								10
11				155	199	243	288	332							11
12				119	155	191	227	262	298						12
13					122	152	181	211	241						13
14					98	124	149	174	199	224					14
15						100	121	142	163	184	205				15
16						83	102	120	138	156	175				16
17							85	100	116	132	147	163			17
18							73	86	100	114	128	142	156		18
19							62	74	86	98	111	123	135		19
20								64	74	85	96	107	117	128	20

Relationship Between Stand Density and Growth

Tables 2, 3, and 4 define the average density that prevailed on the 24 study plots at the start of 68 plot-growth periods. The samples included a rather wide variation in stand densities—from less than 60 percent to more than 140 percent of the average density defined in Table 2. Relationship between stand density, *as measured by the new standard*, and growth is shown in Figure 3. Growth is expressed as a percentage of the normal net cubic-foot increment for the sites and ages sampled as defined by the normal yield tables for natural stands (*13*). Normal growth on Site III ranges from 210 to 140 cubic feet per acre per year for the ages sampled. Growth periods ranged from 2 to 8 years in Denmark, 5 to 6 years in Washington, and were consistently 5 years in Prussia. For each additional unit of growing stock left in the stand, gross growth increased, but at a constantly diminishing rate. Up to about 90 percent density the increase in growth was substantial. Comparatively little additional growth resulted from the maintenance of growing stocks greater than 100 percent of the standard. The curve of gross growth levels off at about 166 percent of normal growth for densities beyond 150 percent. This 166 percent of normal appears to represent the growth potential of the site. At 100 percent density the expected gross growth is 154 percent of normal. This indicates that when density was maintained at the standard of Table 2, about 93 percent of the total growth potential of the site was realized. This small reduction in total volume increment may be greatly overcompensated by obtaining superior development of the best trees in the stand and by obtaining earlier returns through the maintenance of growing stocks below the extreme level apparently required to obtain the total volume-growth potential.

Relationship of gross growth to level of growing stock, as measured by the standard proposed, is simi-

TABLE 3.—STANDARD BASAL AREA PER ACRE BY AVERAGE DIAMETER AND AVERAGE HEIGHT

Av.	Average stand height, feet														Av.
d.b.h.	30	40	50	60	70	80	90	100	110	120	130	140	150	160	d.b.h.
Inches	*Basal area per acre (sq. ft.)*														*Inches*
4	82	124	167												4
6		90	126	163											6
7		79	113	148	182										7
8			102	135	168	201									8
9			91	123	155	186									9
10				112	142	173	203								10
11				102	131	160	190	219							11
12				93	122	150	178	206	234						12
13					112	140	167	194	222						13
14					105	133	159	186	213	238					14
15						123	148	174	200	226	252				15
16						116	142	168	193	218	244				16
17							134	158	183	208	232	257			17
18							129	152	177	201	226	251	276		18
19							122	146	169	193	219	242	266		19
20								140	161	185	209	233	255	279	20

TABLE 4.—AVERAGE RADIUS OF GROWING SPACE PER TREE FOR DOUGLAS-FIR STANDS OF STANDARD DENSITY BY AVERAGE DIAMETER AND AVERAGE HEIGHT

Av.	Average stand height, feet														Av.
d.b.h.	30	40	50	60	70	80	90	100	110	120	130	140	150	160	d.b.h.
Inches	*Radius in feet*														*Inches*
4	3.4	2.8	2.4												4
5	4.7	3.8	3.2												5
6		4.9	4.1	3.6											6
7		6.1	5.1	4.4	4.0										7
8			6.1	5.3	4.8	4.3									8
9			7.2	6.3	5.6	5.1									9
10				7.3	6.5	5.9	5.4								10
11				8.4	7.4	6.7	6.2	5.7							11
12				9.6	8.4	7.5	6.9	6.4	6.0						12
13					9.4	8.5	7.8	7.2	6.7						13
14					10.5	9.4	8.6	7.9	7.4	7.0					14
15						10.4	9.5	8.8	8.2	7.7	7.3				15
16						11.5	10.3	9.5	8.9	8.4	7.9				16
17							11.3	10.4	9.7	9.1	8.6	8.2			17
18							12.2	11.3	10.4	9.8	9.2	8.8	8.4		18
19							13.2	12.1	11.2	10.5	9.9	9.4	9.0		19
20								13.0	12.1	11.3	10.6	10.1	9.6	9.2	20

lar for the intensively managed Douglas-fir in Denmark and Prussia and for the same species growing in its natural habitat in western Washington, either in thinned or in natural unthinned stands. Significant differences could not be detected in the data available. Above normal increment has been found common in young Douglas-fir in previous studies (*3, 4*).

The correlation index of the relationship in Figure 3 is 0.514 and is statistically significant at odds of 99 to 1. Although this indicates that only about 26 percent of the variation in periodic growth is explained by stand density, it must be remembered that other factors such as site, age, genotype, and variation in growing season precipitation also greatly influence growth rate. Error in measurement is also a factor. Although trends of the growth-growing stock relationship in Europe and in western Washington were very similar, the European data were more variable. Part of this greater variation may be due to the short intervals between measurements on the European plots. Though free from bias this practice tends to result in relatively larger errors of periodic growth.

Residuals of the growth-density correlation in Figure 3 were analyzed. Though not found to be related to stand age and site, the possibility of such relationships should be studied further as additional data become available.

On the European plots, gross growth and net growth are identical because every tree that dies is used. This is rarely the case in the Pacific Northwest. Thus, for the western Washington plots, trend of net increment is also shown in Figure 3. For these plots net growth reached a maximum of 140 percent of normal at about 92 percent density. Net growth was lower at both lesser and greater densities but the decline was sharper when density was diminished than when increased. The spread between trend lines in Figure 3 represents the loss in increment that resulted from tree mortality during 5- and 6-year growth periods. This loss was lowest at 75 percent density; at lower densities mortality increased owing largely to overexposure and windfall; at higher densities mortality caused by suppression increased. If part of the mortality that occurs is salvaged, the indications are that maximum net growth in the Douglas-fir region will be obtained with growing stocks of greater than 92 percent density by the new standard. High-order thinnings are now being made at 2- to 5-year and longer intervals on a commercial basis in the more accessible parts of the region. Under such conditions it is believed that about half of the mortality that occurs can be utilized at a profit. If this is the case, maximum net increment should be obtained at densities of about 100 percent. Differences in net increments resulting from densities ranging from 90 to 120 percent with thinnings at 2- to 4-year intervals probably would be small.

Use of the New Density Standard

To illustrate the use of the new density standard, assume we have a stand that averages 9 inches in d.b.h., 70 feet in total height, and 425 trees per acre. Opportunities are promising for making thinnings of 400 to 1,000 cubic feet per acre at a profit every 2 to 5 years. The owner wishes to cash in on these opportunities. At the same time he wishes to improve the quality of his forest, and to maintain net increment at about the maximum level possible under his operating conditions. He also wishes to maintain a small margin of safety in his growing stocks so that the volume of cut can be increased prudently during favorable peaks in the market in the future. As a compromise he elects to maintain density at about 100 percent of the new standard in Table 2. Reference to

Table 2 indicates that such a stand, after thinning, should contain about 350 trees per acre. Thus, about 425 minus 350, or 75 trees, averaging about 9 inches in d.b.h., may be removed in the initial harvest.

If the trees to be removed average smaller than 9 inches, more than 75 may be cut. Conversely, if the trees to be cut average larger than 9 inches, fewer than 75 should be removed. Removal of trees larger or smaller than the stand average will change the average d.b.h. and height of the remaining stand. For most extensive applications it is believed that adequate control of growing stock to be cut in the first thinning may be provided conveniently by reference to Table 3. This indicates that stands averaging 9 inches in d.b.h. and 70 feet in height should contain 155 square feet of basal area after thinning. Since basal area in the existing stand totals 188 square feet per acre, 33 square feet or about 18 percent of the present stand may be removed. Reference to Bruce's yield table based on average d.b.h. indicates that such a first cut would yield a harvest of about 938 cubic feet per acre. (This may be computed conveniently from Table 25, page 68 of reference (*13*).) If the average d.b.h. of trees to be cut differs widely from the average of the original stand and if close control over density in the reserve stand is desired, several successive approximations may be needed in computing the cut that will yield the exact density that is wanted. Such a procedure may be required in making thinnings on experimental plots.

Obviously, all the guides of good silviculture must be considered in marking the individual trees to be taken (*1, 5, 6, 9, 10*). A few specific precautions are recommended. Extremely overdense stands, i.e., those of 130 percent or greater densities should not be reduced to the standard of Tables 2 and 3 in a single cut. Experience in both Europe and the Pacific Northwest indicates that the reduction should be spread over two or three thinnings and 5 to 15 years. Until better guides are available it is believed that thinnings should never reduce growing stocks below 75 percent of the standard represented by Tables 2 and 3. Preferably, density should never fall below 90 percent of the standard given in Tables 2 and 3 until it is time to regenerate the stand. Indications are that at least this amount of growing stock will be required to obtain the growth that the site is capable of producing.

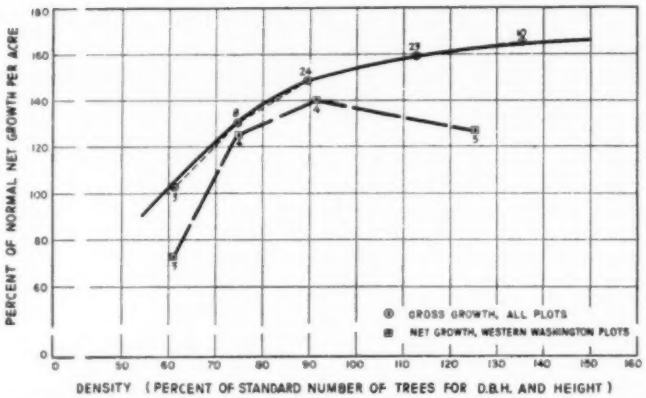


FIG. 3.—Growth of young Douglas-fir is related to level of growing stock. Increment is expressed as percent of normal cubic-foot growth for the site and age, density as percent of the standard represented by Table 2.

Many natural young Douglas-fir stands contain fewer trees on the average acre than the numbers indicated as desirable in Table 2. Nevertheless, these stands often need the benefit of silvicultural thinnings because the trees grow in dense groups. Table 4, which shows desirable radius of growing space for trees of different sizes, can serve as a guide in determining how much to cut in this situation. For good development of individual trees there should be little overlap and little space between the growing circles. Still, this guide should not be followed rigidly. It is believed more important that the trees of best quality and thrift are left after each thinning than that the trees are precisely spaced. It is also important to maintain enough trees on the site to utilize its productive capacity. Tables 2, 3, and 4 and Figure 3 should be helpful in determining how many are needed.

In computing average stand d.b.h., the same standards of measurement should be used as were used in the normal yield tables (*13*). This means that all trees greater than 1.5 inches in d.b.h., except those in the understory, should be included. Diameters should be weighted by basal area in determining their average. Appropriate interpolations should be made in using Tables 2 and 3, ordinarily to the nearest tenth-inch in average d.b.h. and to the nearest foot in height.

Forest managers also need to know the value and hence the volume of merchantable products left after thinning as an investment in timber growing. Bruce (*13*) has shown that merchantable cubic-foot and board-foot volumes are quite closely correlated with number of trees, average d.b.h., and average height in young Douglas-fir. Thus, the identical variables used in the proposed density standard will also provide a ready approximation of growing-stock volume in terms of merchantable products. For example, schedules similar in form to Tables 2 and 3 but showing cubic-foot and board-foot volumes can be derived readily from Table 2 and the Bruce yield tables.

The best interval between thinnings for different stands will differ with growth rates and with operating costs and returns. A few Northwest stands are now being

thinned experimentally but on a commercial scale at intervals of 2 to 8 years, as were the Danish plots. Certain stands in Denmark are thinned every year. Some stands in the Northwest may be thinned this frequently and at a profit in the near future, but most stands are likely to require a longer period between thinnings — perhaps 3 to 15 years. Presumably, the older, less-accessible stands on poorer sites will be thinned somewhat more heavily and less frequently than will young, vigorous stands on good sites close to markets and where logging costs are relatively low. Tables 2 and 3 plus the new Douglas-fir yield tables based on average diameter and average height (see (*13*), pages 68-73) will be found helpful in predicting the optimum periods between thinnings for a specific stand.

Decisions on volume of growing stock to maintain in any given forest should be based in part on considerations of wood quality (*15*, *16*). Much additional research must be completed to define in detail the effects of stand density on wood characteristics. But, in general, what is known suggests that the denser stands produce Douglas-fir higher in specific gravity and strength qualities, and finer grain. This is added incentive for the maintenance of fairly high stand densities. Another advantage of carrying a relatively heavy volume of growing stock lies in the flexibility it gives the forest manager. It may enable him to increase the cut temporarily to take advantage of good markets without seriously impairing future productivity. This is not possible if growing stocks are constantly kept at or below the minimum required to yield potential growth. Additional volume may also be desirable as a safety factor.

In the production of such specialty items as piling and poles the forest manager may need to give attention to stand density. On the plots studied, stand height as a percentage of normal height for stand d.b.h. tended to remain constant when density was cut back to about 100 percent of the standard of Table 2. When lower densities were maintained, stand height as a percentage of normal for the d.b.h. tended to decline; at higher densities stand height as a percentage of normal tended to increase as shown below:

Initial density (percent)	60	80	100	120	140
Av. annual change in normal height (percentage points)	−0.5	−0.2	0.0	+0.2	+0.5

Thus, if it is desired to maintain the prevailing percentage of normal height in a stand, density should be held fairly close to 100 percent of the proposed standard. If an increase in the existing percent of normal height is desired for the production of stems with little taper, density should be maintained at somewhat greater than 100 percent. If reduction in prevailing percent of normal height is desired, for example to develop windfirmness, density should be very gradually reduced to say not less than about 75 percent.

Conclusion

Evidence indicates that the space a young Douglas-fir tree can utilize is related to both its diameter and height. Recognition of this relationship is important when devising density standards that must apply to forests in which height at a given d.b.h. may vary greatly. Such an approach is proposed and a suggested preliminary standard is presented.

Intensively managed Douglas-fir in Denmark and Prussia, up to age about 60 years, has produced increments ranging from 30 to 70 percent greater than the rate of increment defined by the normal yield tables for the Pacific Northwest. Gross growth of Douglas-fir, both thinned and unthinned, on permanent sample plots in western Washington has been as great as that obtained in Europe. Increment per unit of growing stock, as measured by the proposed standard, was similar in both areas. Varying with the density that was maintained, from 4 to more than 30 percent of gross increment in western Washington was nullified by tree mortality. There is good prospect that the high yields of Douglas-fir the Danes have obtained under intensive management can be equaled or exceeded by the maintenance of similar growing stocks and utilization to similar standards in the Pacific Northwest. Optimum growing stock will vary with management objectives, utilization, and marketing opportunities as well as with the silvicultural requirements of the individual stand and thus will differ area by area. It is believed that optimum densities for most combinations of factors will be found to lie between 75 and 120 percent of the proposed standard.

No evidence that thinning increased total gross growth was found in the data. There is evidence that thinning resulted in a greater rate of growth on stems selected for later harvest, in earlier returns, and in the production of larger average tree sizes. Light thinnings in western Washington resulted in increased net growth through reduction of tree mortality; heavy thinnings resulted in decreased net growth, owing partly to deficiency of growing stock, partly to mortality sustained after overexposure of the remaining trees.

Discard of the conventional yardsticks of growing stock is not proposed. Rather, it is suggested that new measures based on average diameter and average height be tested thoroughly, along with all others that have promise. Only comprehensive thinning experiments, extending over a rotation and sampling important variations in type, soil-site, and utilization facilities, can provide authoritative answers for the many puzzles of growing-stock control. In the meanwhile, it is believed that height-diameter measures of stand density may help today's foresters reach decisions that will lead to increasingly productive forests.

Literature Cited

1. BAKER, F. S. 1934. Theory and practice of silviculture. McGraw-Hill Book Company, N. Y.
2. ———. 1950. Principles of silviculture. McGraw-Hill Book Company, N. Y.

3. BRIEGLEB, P. A. 1942. Progress in estimating trend of normality percentage in second-growth Douglas-fir. Jour. Forestry 40:785-793.
4. ———— and J. W. GIRARD. 1943. New methods and results of growth measurement in Douglas-fir. Jour. Forestry 41:196-201.
5. DOUGLAS-FIR SECOND GROWTH MANAGEMENT COMMITTEE. 1947. Management of second-growth forests in the Douglas-fir region. Pacific Northwest Forest and Range Experiment Sta. Portland, Ore. (Processed.)
6. ————. 1950. Your trees—a crop. Pub. by Div. of Forestry Dept. of Conserv. and Development, State of Wash., Oreg. St. Bd. of Forestry, College of Forestry Univ. of Wash., Sch. of Forestry Oreg. St. College.
7. GEVORKIANTZ, S. R. 1944. Measuring stand normality. Jour. Forestry 42: 503-508.
8. ————. 1947. More about numerical expression of stocking in terms of height. Jour. Forestry 45: 203.
9. HAWLEY, RALPH C. 1946. The practice of silviculture. 5th ed. John Wiley & Sons, N. Y.
10. HOLM, FOLKE. 1940. Douglasgran, proveniens og vækst. Forstlege Forsøgsvæsen i Danmark 15: 233-312, illus.
11. ILVESSALO, YRJO. 1950. On the correlation between the crown diameter and the stem of trees. Inst. Forest. Fenniae Commun. 38(2), 32 p., illus.
12. LEXEN, BERT. 1943. Bole area as an expression of growing stock. Jour. Forestry 41:883-885.
13. MCARDLE, R. E., W. H. MEYER, and DONALD BRUCE. 1949 (rev.). The yield of Douglas-fir in the Pacific Northwest. U. S. Dept. of Agric. Tech. Bul. 201.
14. MULLOY, G. A. 1944. Stand density vs. stand bole area and stand intensity indices in even-aged stands. Forestry Chron. 20(3):167-170.
15. PAUL, BENSON H. 1932. Improving the quality of second-growth Douglas-fir. Jour. Forestry 30:682-686.
16. ————. 1950. Wood quality in relation to site quality of second-growth Douglas-fir. Jour. Forestry 48:175-179.
17. REINEKE, L. H. 1933. Perfecting a stand-density index for evenaged forests. Jour. Agric. Res. 46:627-638.
18. WILSON, F. G. 1946. Numerical expression of stocking in terms of height. Jour. Forestry 44:758-761.
19. ZEHNGRAFF, PAUL J. 1950. Forestry in Denmark. Jour. Forestry 48:681-684.

The Paper Industry and the Southland Mill[1]

W. L. McHale
Vice president and mill manager, Southland Paper Mills, Inc., Lufkin, Texas.

THE PAPER INDUSTRY as we know it in this country today, with its vast varieties of grades, colors, weights, texture, and uses expanded from a very small beginning to an enterprise which ranks among the first six industries of the nation.

Paper and paperboard products are most essential for wrapping, packaging, and printing purposes, pacing closely the march of our civilization. Perhaps the oldest use was a medium of recording and conveying the written word, making possible the diffusion of knowledge. Today the events of history, the works of literature, art, and science are recorded in newspapers, magazines, pamphlets, and countless books for current use and for posterity.

The ancient method of chiseling messages on rock was slow and laborious and, no doubt, the messages often became history before they were completed. But that was the only means known prior to the time the Egyptians learned to make paper-like sheets by splitting the pith of the papyrus plant into thin strips, pressing them together and allowing them to dry. Although such sheets could not be called paper, the name *paper* had its derivation from the word *papyrus*.

The Chinese are said to have been the first true paper makers, having made pulp and paper from bamboo fiber as early as 150 A.D. As the centuries passed, the art of paper making was gradually improved, spreading to Egypt, Spain, France, Germany, England, and finally, to America.

Wood Pulp Development

It was not until 1850, or 100 years ago, that wood pulp began to be used, coming more and more in demand as a raw material with the growth of the industry, until now practically all the mass tonnage of paper and paperboard products made in this and other countries utilize various species of wood.

The paper industry in the United States had its beginning in New York and New England, first utilizing rags and linen waste. When cheaper and more abundant wood pulp was brought into use, the industry spread through the northeastern spruce timber belt. In this area the newsprint industry has expanded and flourished within the limits of the available wood supply. Next, the industry spread to the forest areas of the mid-western states, and to the West Coast.

At the turn of the century, the growing demand for newsprint led to the establishment of the industry elsewhere on the continent.

Canada, with its vast timberlands and numerous rivers capable of supplying transportation, power, and water for pulp and paper mills, was the logical direction in which the paper industry was to spread. The apparent limitless stands of spruce offered ideal raw material needed to meet the ever-increasing demand for newsprint, and inspired industrial leaders to construct many new mills and open up vast new frontiers.

Expansion was gradual at first, gathering momentum with the development of larger, heavier, and faster machines, backed by larger pulp producing equipment making possible greater unit production per machine and per man. The construction pace accelerated in the early 'twenties, and the next ten years witnessed the greatest expansion of newsprint production capacity in any decade in history.

Decline of Newsprint Manufacture in U. S. A.

As this great expansion was going on in Canada, the production of newsprint in the United States mills remained almost static, reaching its peak of 1,700,000 tons

[1]Paper presented at a meeting of the Division of Forest Products, Society of American Foresters, Biloxi, Miss., December 14, 1951.

in 1926. The annual U. S. production decreased gradually from that year until 1938 when the tonnage was only one-half that of 1926. During the same period the tonnage from the Canadian mills increased more than 150 percent.

It was about 1936, when the newsprint production was on the decline in the U. S. and on the increase in the Canadian mills, that consideration was given by southern industrial leaders and publishers to the feasibility of manufacturing newsprint from southern pine. If successful, such a mill would provide new use for abundant raw material and augment the supply of newsprint for American newspapers which are, by far, the greatest consumers of newsprint in the world.

Pioneers in Southern Newsprint

While the prospects of a southern newsprint mill were talked about among business leaders, both within and outside the paper industry, the project received its greatest impetus toward reality through the efforts of such leaders as Dr. Charles Herty, Francis P. Garvin, Louis Calder, and Ernest L. Kurth. These men gave unselfishly of their time and talents toward surmounting the many obstacles encountered in the course of developing a pioneer industry such as the Southland Paper Mills at Lufkin, Tex.

Preliminary Work

Several carloads of southern pine pulpwood were shipped to a northern newsprint mill and ground for trial runs. Prolonged technological research was carried out in Savannah, Ga. laboratories, the results of which proved that there was more than a fair possibility that commercial newsprint could be made from southern pine wood.

Many possible mill sites were surveyed in the timber belt of eastern Texas. Lufkin was chosen because of good wood, water, fuel, and transportation conditions.

The wood supply, principally shortleaf pine, was abundant in Angelina and nearby counties. Railroads assured adequate transportation both for incoming materials and outgoing products, and an abundant supply of natural gas fuel was available from a utility pipeline passing adjacent to the selected site.

All these essentials could be readily appraised by local authorities. A careful and prolonged study, however, had to be made of the water-bearing strata in the area to be assured of a continuous supply of clear water of suitable quality.

Surveys made by geologists of the U. S. Department of the Interior, working in conjunction with Texas state geologists, assured the company that adequate groundwater could be pumped from what is known as the Carrizo Sands. Exploration work extended over a wide area to be certain that an abundant supply was available not only for a one-unit or one-machine mill, but for a possible second or third unit if conditions should warrant such expansion.

The first unit at Southland has now been operating a little over 11 years, and a second unit about 3½ years. The groundwater level has been lowered in the pumping area during the years of increased pumpage, but the present elevation of water in the pumping area coincides with the level predicted by the geologists, and has remained constant for more than 2 years. During the past 3 years the mill has been pumping at a rate of 14,000,000 gallons a day.

The Mill

The large mill at Lufkin was built in three steps over a period of 8 years. The first unit, with a rated capacity of 150 tons of newsprint per day, went into production in January 1940, nearly 12 years ago. This unit included equipment for making groundwood pulp, but the bleached kraft pulp required for making the newsprint sheet was purchased from the paper mill at Pasadena, Texas. About 80 percent of the fine groundwood fibre and 20 percent of bleached kraft are used in making newsprint.

The second step was the construction of a 175-ton per day kraft pulp mill, including a large pulp drying machine and equipment for bleaching the kraft pulp required in the newsprint. When this extension was completed in January 1944, the Southland mill was integrated and self-contained.

The third step was the installation of a second large paper machine and components and pulp making equipment. This machine, brought into production in March of 1948, more than doubled the newsprint production capacity, which through increased efficiency, now averages about 380 tons a day.

The entire plant, comprising buildings, equipment, yards, railways, tracks, and utilities was engineered to facilitate orderly, efficient, and continuous operations. The buildings are concrete, brick, and steel. The equipment is modern, efficient, and rugged to withstand the wear and tear of constant service. The yards provide for outside storage and expansion. Railway tracks serve the three main loading platforms and the storage areas in the yard.

The mill operates 24 hours a day, 7 days a week, stopping only for occasional maintenance work and on the six scheduled holidays during the year.

There are about 720 employees engaged directly with mill operations, the majority employed in the direct line of production. Some are engaged in technical control work, many in mechanical and electrical maintenance. Others are engaged in shipping, purchasing, engineering, timekeeping, accounting, and personnel work.

An additional 130 handle pulpwood procurement. A majority of this group harvest pulpwood in the form of poles to supplement the cordage supplied by private contractors.

Regular personnel totals about 850 employees, who were paid over $3,000,000 in wages and salaries during 1950.

Production & Raw Materials

During its peak year, 1950, the Southland mill manufactured and

shipped 160,000 tons of paper and paperboard products, about 130,000 tons being newsprint. Though sizable, this represents less than 1 percent of the total mass tonnage of paper and paperboard products made in North America during 1950.

Practically all Southland products are shipped by rail, requiring about 18 cars per day, or some 6,500 carloads a year.

To manufacture this paper tonnage required 230,000 cords of pulpwood, most of which was produced within a 50-mile radius of Lufkin. Delivered to mill yard it cost $3,275,000.

Pulpwood is not the only raw material required: 5,500 tons of sodium sulphate, commonly called "salt cake," 3,500 tons of liquid chlorine, and 2,000 tons of caustic soda, and many carloads of alum, rosin size, starch, soda ash, and disinfectants were used last year.

Problems of the Original Mill

The first newsprint unit at Lufkin was a pioneering undertaking, but most of the original equipment was similar to that installed in other newsprint mills in the spruce timber areas. More power, however, was provided for grinding, as preliminary tests showed that at least one-third more power was needed to grind southern pine than to grind spruce for making a comparable tonnage of groundwood acceptable for use in newsprint. Although efforts have been directed toward reducing the required grinding power, very little progress has been made in this direction, but we have been able to develop and maintain a uniform quality of groundwood suitable for making high grade newsprint efficiently at machine speeds of 1,500 feet per minute.

Because of the high rosin content of southern pine, the operators anticipated trouble with pitch formations when processing groundwood. In order to reduce the number of variables and thereby develop some systematic pitch control within the mill, it was considered necessary to use only carefully selected pulpwood for the grinders during the initial running period. Specifications required that such pulpwood be fresh cut, straight, round, and free of knots and heartwood. Although the initial requirements were only 130 cords a day, it was not always possible to procure this volume within the desired specifications. Knot boring equipment was provided to remove objectional pitch-ladened knots and rossers were utilized to eliminate deformities on barked logs.

It was also thought desirable to soak the barked wood in hot water for a period of 6 to 8 hours prior to the grinding process with the expectation of reducing the detrimental effect of the rosin content. The hot water soaking process was cumbersome and expensive. When it was discontinued at a later date, it was found that little or no benefit had been derived from the presoaking of wood, and an item of expense had been eliminated.

Wood specifications were relaxed after pitch control was somewhat perfected within the mill, permitting the use of logs containing heartwood. We continued to use the knot borers and rossers, however, more as a precautionary measure to reduce damage or burning of pulpstones. Wood less suitable for grinding was later diverted to a chipper when the kraft mill was put in operation in January 1944. The more uniform logs were then selected for grinding. This has continued to be our practice.

Pitch deposits appeared on screens, deckers, and wires when the initial groundwood was processed through the mill, and actually "gummed up the works." Preliminary tests indicated that the application of alum in the groundwood system would stabilize the pitch, but as there was no known formula to determine the quantity and point of application, the technique of pitch control had to be developed. A systematic correlation of pitch control technique with operating conditions furnished the basic information that led to the development of ultimate controls. Pitch deposits diminished when the slush groundwood was kept in an acid condition. The most beneficial points of application were determined after many months of constant exploratory work, and the quantity of chemical application was then maintained by means of automatic control equipment. When this control system was perfected and the stock system maintained in an acid condition, the fine pitch particles adhered to the groundwood fibers processed into the newsprint sheet.

The original idea of a newsprint mill was conceived by a few industrial leaders. The execution of the project was made possible by the coordinated effort of many hands, hearts, and minds.

Southland is a successful, well established industry contributing enormously to the general well-being of Texas, an outstanding example of what can be accomplished by industrious citizens working under a free enterprise system. It is America's hope that we shall continue to have both men of vision and the free enterprise system.

The Effect of Source of Seed on Growth of Jack Pine[1]

T. Schantz-Hansen and R. A. Jensen
Professor and assistant scientist, respectively, School of Forestry, University of Minnesota.

American foresters are giving greater attention to provenance of seed source in producing stock for forest plantings. Failure to recognize the existence of wide variation in tree species or the existence of geographic and local strains has resulted in serious losses and failures of many early forest plantings in this country as well as in Europe.

EUROPEAN EXPERIENCE with Scotch pine has been described by Pearson (*7*), Baldwin (*1*), and Isaac (*4*). Many of the serious failures of European planting of this species appear to have resulted from the planting of genetically inferior strains and to strains not climatically suited to the region. As a result of these experiences most European countries have adopted rules and laws regarding provenance or source of seed for all important forest species (*2*). In Sweden, Norway, and Germany forest-tree seed certification is similar to that practiced for agricultural crop seed in this country.

Source-of-seed studies on several American conifers were started as early as 1911. Munger and Morris (*5, 6*) have reported on the growth and survival of Douglas-fir plantings of known seed source. The marked effect of seed source on the growth and survival of these plantings and the importance of giving greater attention to provenance in connection with selection of stock for the rapidly-expanding planting program in the Pacific northwest is emphasized by Isaac (*4*) in his recent monograph on Douglas-fir seed. A similar source-of-seed study with Ponderosa pine has been reported by Weidman (*10*). With this species, as for Douglas-fir, the success or failure of forest plantings is often determined by source of seed or selection of a strain adapted to the climatic and other growth conditions of the planting area. Rudolf (*8*) and Wakeley (*9*) have reported similar large variations in growth and survival for forest plantings of various seed sources made with red pine and loblolly pine, respectively.

The forest-tree species for which the existence of geographic strains or races has been demonstrated have rather broad latitudinal and longitudinal ranges. The results with other important American coniferous species of wide distribution would indicate that geographic races or strains would likewise exist for jack pine (*Pinus banksiana*) which has a longitudinal range extending from the 65th to the 130th meridian and a latitudinal range extending from 42 to 65 degrees. Thus it nearly spans the continent in a rather broad band from the Atlantic Coast in Maine to the Rocky Mountains in northwestern Canada. In growth habit it exists from the almost prostrate form on the Atlantic to trees of good form and 80 to 90 feet in height in Minnesota and Ontario. In addition to the possible existence of geographic races, field observations indicated the possible existence of local strains or races. Natural stands of poor form and vigor that cannot be ascribed to growing conditions are known to exist. Individual stands and trees bearing cones that open soon after maturity are likewise common and present a direct contrast to the trees and stands with typically serotinous cones. In addition, as in most forest stands, there are individual jack pine trees that stand out because of their exceptional form and development.

This previously despised weed species has grown in importance with the years and it is now one of our leading species for saw timber, pulpwood, and poles. Horn (*3*) gives the 1946 production of jack pine pulpwood in the Lake States as 492,645 cords, with 332,745 cords of this total produced in Minnesota. The excellence of jack pine as pulpwood and its increasing use for lumber, mine timbers, poles and numerous other wood products has made it a favored species for forest planting in the Lake States.

The evidence of the possible existence of locally superior strains of jack pine and of geographic races of this species, combined with the increasing importance of jack pine as a timber tree in the Lake States and Canada, stimulated the initiation of this study at the University of Minnesota Experimental Forest at Cloquet in 1940.

Objectives

The objectives of this study were:

a. To grow, under uniform growing conditions on the experimental forest, stock grown from seed collected from various locations throughout the range of the species.

b. To compare stock grown from seed collected from what appear to be superior or distinct local strains of the species, such as those with cones that typically open at maturity as contrasted to those with typically serotinous cones.

c. To determine whether other factors, such as insect damage, influence the form and growth of local and geographic races or strains of jack pine.

It is recognized that no final conclusions as to the suitability for Lake States' planting of materials included in these plantings can be drawn from the results obtained to date in this source-of-seed study, but the plantings have developed to a point where a report on their progress and of significant differences is desirable.

Establishment

Seed collections were made through the cooperation of forestry organizations in the United States and Canada to provide a reasonable coverage of the range of the

[1]Published as Scientic Journal Series Paper 2561 of the Minnesota Agricultural Experiment Station.

species. Collections were made at Park Rapids, Jenkins, Chisholm, Grand Marais, Hinckley, Cloquet, and Peterson in Minnesota. The last location is an outpost of native jack pine occurring in southeastern Minnesota's unglaciated area. In Michigan, collections were made at Huron, Manistique, Wellston, and Baldwin. One collection was made in Wisconsin at Eau Claire, near the southern limit of jack pine in that state. In the New England region, collections were made in Acadia National Park at Bar Harbor, Maine, from the Bass River State Forest in New Jersey and from the region around Burlington, Vt. The last two selections were from planted stands, the seed being of Minnesota origin. They have been included to determine, if possible, what effect transplanting to a new environment for one generation may have on the following generation. Canadian collections came from the Ft. McMurray district, the Iroquois Lake district, and the junction of the Athabasca and Lesser Slave Rivers in Alberta; from Regina in Saskatchewan; from the Pas and the Sandiland Forest Reserve in Manitoba; from Chalk River and Ft. Francis in Ontario; from the Lake St. John region in Quebec; from the Miramichi region in New Brunswick. At Cloquet, seed was collected from trees of good and poor form and from trees producing cones that open on maturing.

The cones were opened by drying in an electric oven at 125 degrees F. Seed was extracted by hand. The seed was then planted in standard nursery beds. Early collections were transplanted once; later collections were moved directly from the seed bed as 2-0 stock to the final planting site. Each collection was planted in a block of 25 trees, using a 5 by 5 spacing with a 10-foot spacing between blocks. The planting site was a cleared area once used for a transplant nursery. The soil is a light loamy medium sand, classed as Omega sand. The use of a cleared area eliminated any variable due to competing vegetation. The plantings were replicated three times. The location of each source within the different blocks was determined by random selection. The first planting was made in 1942, the second in 1943 and the third in 1944. In 1943 a planting was made on the grounds of the Hormel Foundation in Austin, Minn., using trees from fifteen widely-distributed sources. These trees were planted in rows and under quite different climatic and soil conditions than at Cloquet. It was not possible to make a complete replication at Cloquet in 1944 since planting stock was not available from all sources. Consequently, only the results of the first two replications and the Austin plantings are reported here.

Present Growth and Condition

Height measurements, survival counts, form estimates, and observations on insect[2] damage have been made annually on all trees since 1945. A total of 6,450 trees is involved in the plantings.

Where collections were made from individual trees of a stand and no differences are apparent in growth, measurements are averaged in this summary. It is recognized that differences may develop as this material grows, and separation of results will be necessary. Since this is a preliminary or progress report and differences are not apparent at this time, such grouping appeared desirable.

Table 1 gives the number and percentage of trees surviving in 1948, average total height in feet, average annual height growth, form classification and winter injury (1947-48) for Block A planted in 1942 and Block B planted in 1943. Table 2 gives the data on the Austin planting.

Survival

Plantings from all sources survived satisfactorily at Cloquet, commonly from 90 to 100 percent. The poorest survival was 72 percent for the planting in Block B from seed collected from trees of good form at Cloquet. This cannot be attributed to unfavorable climate because the corresponding trees planted in Block A had a survival of 89 percent. Other sources with survival below 90 percent were Baldwin, Mich., (poor form collection) with 84 percent in Block respectively, the Wellston, Mich., (good form collection) with 83 and 78 percent in Blocks A and B, and the Regina, Saskatchewan, collection with 88 percent in both Blocks A and B. From the standpoint of early survival there seems to be little difference in behavior of the trees from the various sources.

Survival in the Austin planting is not as uniform as at Cloquet. Survival at Austin ranged from a high of 96 percent for the Peterson, Minn. and Fort Francis, Ontario, selections to a low of 39 percent in the Miramichi, New Brunswick, and The Pas, Manitabo, selections. In general, the far northern sources seem to have a lower survival than the more southerly sources. Since this planting was not under constant observation, it is difficult to judge whether the survival is caused by characteristics inherent in the trees or to some external cause.

Growth Rate

It is difficult to make any final or conclusive comparisons of growth rate between the different sources at this time since they are all in the juvenile stage. The problem is further complicated in the case of the Cloquet plantings by insect injury which often has removed the current year's leader, thus giving a lower average height of the trees than would have been the case if they had been normal. In Table 1, the trees from various sources are arranged according to the rapidity of height growth for the Block A planting. The average annual height growth ranges from 1.07 for the New Jersey selection to .24 feet per year for the Eau Claire Wis., selection. Trees grown from local seed were exceeded in growth rate by selections from New Jersey; Hinckley, Minn. (Fig. 1); Peterson, Minn.; "good form" trees from Manistique, Mich.; "good form" trees from Baldwin,

[2]Dr. A. C. Hodson, forest entomologist, Division of Entomology and Economic Zoology, University of Minnesota, has generously cooperated in making estimates of insect damage and providing identification of insects involved.

TABLE I.—SURVIVAL, GROWTH, DEVELOPMENT, AND HARDINESS OF JACK PINE SOURCE OF SEED PLANTINGS AT CLOQUET FOREST

Source of Seed	No. of trees and survival				Total Age	Average annual height growth		Average height, 1948		Percent of trees in each form class, Blocks A and B						Percent of trees with winter injury,[1] Spring, 1948, Blocks A and B							
	Block A		Block B			Block A	Block B	Block A	Block B	Good		Fair		Poor		Killed		Severe		Moderate		Light	
										A	B	A	B	A	B	A	B	A	B	A	B	A	B
	No.	*Percent*	*No.*	*Percent*	*Years*	*Feet*		*Feet*		*Percent*													
1. Bass River Forest, N. J.	25	100	25	100	8	1.07	.95	8.6	7.6	0	4	16	12	84	84	—	—	—	—	—	—	—	—
2. Hinckley, Minn.	25	100	25	100	8	1.01	1.02	8.1	8.2	4	12	12	16	84	72	—	—	—	—	—	—	—	—
3. Peterson, Minn.	25	100	25	100	8	.97	.94	7.8	7.5	0	0	0	4	100	96	—	—	4	—	4	12	32	28
4. Manistique, Mich. (good form)	124	99	122	98	8	.90	.77	7.2	6.2	1	0	6	4	93	96	—	—	1	—	3	2	9	18
5. Baldwin, Mich. (good form)	25	100	24	96	8	.85	.52	6.8	4.2	12	0	12	0	76	100	—	—	32	42	44	38	20	8
6. Jenkins, Minn.	274	99	273	99	10	.83	.78	8.3	7.8	5	3	7	7	88	90	—	—	—	—	—	—	4	—
7. Cloquet, Minn. (open cones)	401	89	310	93	9	.84	.70	7.6	6.3	2	3	6	5	92	92	—	—	—	—	—	—	1	—
8. Cloquet, Minn. (good form)	246	89	179	72	9	.82	.79	7.4	7.1	2	4	6	4	92	92	—	1	—	—	4	—	—	1
9. Park Rapids, Minn.	249	99	239	96	10	.81	.73	8.1	7.3	4	2	6	5	90	93	—	1	—	—	2	—	—	2
10. Cloquet, Minn. (poor form)	333	95	332	95	9	.81	.70	7.3	6.3	3	4	6	4	91	92	—	—	—	—	—	—	1	—
11. Cloquet, Minn.	248	59	238	95	10	.80	.71	8.0	7.1	4	7	6	4	90	89	—	—	—	—	—	—	—	1
12. Sandiland, Man.	24	96	24	96	8	.80	.85	6.4	6.8	9	0	4	0	87	100	—	—	—	—	—	—	—	—
13. Chisholm, Minn.	197	99	191	96	10	.80	.69	8.0	6.9	3	2	6	7	91	91	—	—	—	—	—	—	—	—
14. Lake St. John, Que.	25	100	25	100	8	.79	.61	6.3	4.9	0	16	4	4	96	80	—	—	—	—	—	4	—	—
15. Ft. Francis, Ont.	25	100	24	96	8	.75	.77	6.0	6.2	0	8	0	8	100	84	—	—	—	—	—	—	—	—
16. Chalk River, Ont.	25	100	25	100	8	.76	.87	6.1	7.0	8	4	4	0	88	96	—	—	—	4	4	12	4	16
17. Grand Marais, Minn.	246	98	239	95	10	.74	.61	7.4	6.1	3	5	9	6	88	89	—	—	—	—	—	—	—	3
18. Huron National For. (good form)	123	98	114	91	10	.73	.67	7.3	6.7	0	0	1	0	99	100	1	3	44	25	28	19	19	32
19. Manistique, Mich. (poor form)	120	96	115	95	8	.72	.86	5.8	6.9	2	2	6	8	92	90	—	—	4	1	6	3	30	32
20. Wellston, Mich. (poor form)	110	88	91	91	8	.72	.60	5.8	4.8	0	0	0	0	100	100	5	4	4	21	36	25	10	36
21. Baldwin, Mich. (poor form)	24	96	21	84	8	.71	.75	5.7	6.0	0	0	0	0	100	100	4	13	72	58	12	12	12	8
22. Huron, Mich. (poor form)	118	94	115	94	10	.70	.64	7.0	6.4	0	0	2	1	98	99	1	2	56	30	24	29	18	23
23. Burlington, Vt.	24	96	25	100	8	.69	.67	5.5	5.4	4	0	4	0	92	100	—	—	12	—	29	4	29	8
24. Athabasca-Lesser Slave R.	25	100	24	96	8	.66	.54	5.3	4.3	0	0	0	0	100	100	—	—	—	—	—	—	—	—
25. The Pas, Man.	25	100	25	100	8	.67	.65	5.4	5.2	4	0	0	0	96	100	—	—	—	—	—	—	—	—
26. Wellston, Mich. (good form)	83	83	78	78	8	.61	.60	4.9	4.8	1	0	0	0	99	100	2	2	49	9	18	16	14	16
27. Ft. McMurray, Alb.	25	100	25	100	8	.59	.59	4.7	4.7	0	0	0	0	100	100	—	—	—	—	—	—	—	—
28. Regina, Sask.	22	88	20	80	8	.46	.54	3.7	4.3	0	0	0	0	100	100	—	—	—	—	—	—	—	—
29. Bar Harbor, Me.	24	96	23	92	8	.41	.34	3.3	2.7	0	0	0	0	100	100	—	—	4	—	21	—	33	13
30. Miramichi, N. B.	24	96	23	92	8	.40	.66	3.2	5.3	4	0	8	0	88	100	—	—	4	—	—	4	4	4
31. Iroquois Lake, Alb.	23	92	24	96	8	.32	.55	2.6	4.4	0	0	0	4	100	96	—	—	—	—	—	—	—	—
32. Eau Claire, Wis.	25	100	25	100	7	.24	.29	1.7	2.0	—	8	—	8	100	84	—	—	—	—	—	—	—	—

[1]Severe—More than ⅔ needles brown.
Moderate—⅓ to ⅔ needles brown.
Light—Less than ⅓ needles brown.

FIG. 1.—Plot of good form jack pine. Seed from Hinckley, Minnesota.

FIG. 2.—Plot of prostrate form jack pine. Seed from Acadia National Park, Bar Harbor, Maine.

Mich.; and the Jenkins, Minn., selection. The rate of height growth in Block B follows the same general pattern as Block A with some minor variations. Some of the variation may have been caused by insect damage. It is interesting to note the behavior of the Bar Harbor, Maine, selection. The seeds for this planting came from prostrate trees on the Atlantic Coast. When the seed was planted at Cloquet it gave promise of producing trees of normal form during the first four years of growth. Since then the trees have taken on an almost prostrate form (Fig. 2), and at 8 years have an average height of 3.3 feet and 2.7 feet for the two plantings. Plantings from Eau Claire seed have the poorest rate of growth followed closely by the Iroquois Lake, Alberta selection which has an average height of 2.6 and 4.4 feet for the two plantings. In general, the selections from the far northern sources have the slowest rate of growth.

The Austin planting follows the same general pattern of growth rate as at Cloquet. The selections from the far north had the slowest rate of growth. The best rate of growth at Austin was found in the selection from Peterson, Minn. Peterson is located in the same section of the state as Austin. The rate of growth at Cloquet was better than at Austin for all selections.

Winter Injury

During the winter of 1947-48 many conifers, both native and exotic suffered rather severe winter injury. There had been considerable speculation as to the specific weather conditions which caused this rather widespread damage. The fall of 1947 had been extremely mild with maximum temperatures ranging from 50 to 60 degrees F. and minimum temperatures usually above 32 degrees F. On November 6 rain fell; it soon turned to snow, and by November 7, more than 8 inches of snow had fallen and the temperature dropped rapidly. By November 11 the minimum temperature was —11 degrees. Maximum temperatures remained below freezing until February 16 when three consecutive days with a maximum of 41 degrees occurred. Whether the rapid drop in November or the three warm days in February was the cause of the winter damage is difficult to determine. However, the winter damage to coniferous trees in Minnesota, Iowa, Wisconsin, and Michigan followed the pattern of the November storm. In the early spring the needles on many conifers at Cloquet began to turn brown. The extent of damage varied from a slight browning of the tips to a complete browning of the needles. Both native and exotic species were affected. The extreme variability of the damage to native trees in the woods seemed to indicate that there may have been a considerable variation in the microclimate. In the Cloquet area, natural stands of jack pine suffered little damage.

Since severe damage was noted on a few plots in both Blocks A and B of the source of seed planting, a detailed check of the damage was made (Table 1). The heavily damaged plots were from seed collected on the Huron National Forest and on the Manistee National Forest at Baldwin and Wellston in the southern penisula of Michigan. Some trees were killed and in some instances as many as 93 percent of the trees showed some injury. The poor form trees from Baldwin had 4 percent killed in Block A and 13 percent in Block B, with 72 and 58 percent respectively showing severe winter injury. Moderate to light winter injury was noted on trees from seed collected at Bar Harbor, Maine, Miramichi, New Brunswick, Peterson, Minn., Manistique, Mich., and Burlington, Vt. Very light injury was noted on trees from seed collected at Jenkins, Minn., Cloquet, Minn., Park Rapids, Minn., Lake St. John, Quebec, Chalk River, Ontario, and Grand Marais, Minn. No winter injury was noted on trees from seed collected at Bass River State

Forest, New Jersey, Hinckley, Minn., Sandilands Reserve, Manitoba, Chisholm, Minn., Ft. Francis, Ontario, Athabasca and Lesser Slave River, Alberta, The Pas, Manitoba, Ft. McMurray, Alberta, Saskatchewan, Iroquois Lake, Alberta, and Eau Claire, Wis.

Most of the trees not killed outright will recover but the rate of growth will be reduced and in many instances the form will be poorer. The severely damaged plots were not the result of being located where an especially unfavorable spot of micro-climate occurred since plantings from the same source suffered damage in both blocks.

No observations of winter injury were made on the Austin plantings.

Form

Determination of form is a difficult matter in young trees, particularly in jack pine where the young stems often have an irregular appearance in the early years. The classification into good, fair, and poor form was made on the basis of observation. Since the judgment of the observer is used in classifying, and the results are not too accurate and are subject to some bias, a standard for judging form was established. Good form trees were those showing a reasonably straight stem with not too heavy lateral branches; fair form trees were those with less straight stems and fairly heavy branches; and poor form trees were those with crooked stems, heavy laterals, and often with the leader missing (Fig. 3). Many of these characteristics may disappear as the tree gets older, and trees classed as poorly formed in the seedling stage may ultimately be entirely satisfactory as crop tree. It will be noted from the results given in Table 1 that the majority of trees from all sources fall in the "poor" form class at this time. Although the trees are planted on a medium to good jack pine site they give every indication of developing into poor-quality jack pine.

Insect Damage

The 1945 measurements and form

FIG. 3.—Poor-form tree—probably the result of insect damage to leaders during several growing seasons.

estimates indicated that much of the poor form might be attributable to insect damage. With the cooperation of Dr. A. C. Hodson, detailed examinations have been made annually to determine the character and amount of damage for each tree. These annual examinations have resulted in the accumulation of a large volume of measurements that may in time give valuable information on the importance of various insects and insect damage in determining form and limiting height growth. Only a summary of this information is presented here.

The insects causing the major part of the damage were the shoot borer (*Eucosoma sonamana*) and the pitch nodule maker (*Petrova albicapitana*). These insects attack both the leaders and laterals. When the leader is attacked it is either killed or weakened to such an extent that it breaks. Since a lateral then replaces the leader a poorly formed tree results. When laterals are affected one or more branches of the whorl may die, and the remaining laterals appear to be stimulated in growth, thus resulting in large persistent lateral branches. The severity of damage by these two insects is shown by the fact that 23 and 40 percent of the leaders and laterals, respectively, were damaged by the shoot borer, and 30 and 53 percent of the leaders and laterals, respectively, were damaged by the pitch nodule maker. It is evident from these observations that a high percentage of the trees in these plantings were attacked by these insects and that this attack may be responsible to a considerable extent for the large number of poor-form trees shown for practically all collections in Table 1.

In addition to the two major insects, considerable damage was done by the sawfly (*Neodiprion lecontei*) and the bud moth (*Petrova pallipennis*). Minor damage was done by the pine web worm, a scale (*Toumeyella numismaticum*), the white pine weevil, pine bark aphid, pine spittle bug, spruce budworm, and the antique tussock moth.

As the trees grow, it may well be that they will pass through the zone where they are susceptible to the insects attacking the leader and they may ultimately develop into desirable-form trees. It is also possible that the incidence of infestation may be less in coming years, although now it seems to be in epidemic proportions. There appears to be no relationship between the source of seed and the amount of infestation except in the case of the sawfly. Sawfly infestation seems to be more severe in the trees from Canadian sources. In three instances, Regina, Saskatchewan, Iroquois Lake, Alberta, and Ft. McMurray, Alberta, where the infestation was heaviest in the plots of the Block A planting, there was also a relatively heavy infestation in the corresponding plots in Block B, which were located at a distance from the Block A plots. Whether this indicates an insect preference or whether it is a question of escape is impossible to state.

Browsing and Disease Damage

Damage by browsing was so limited in extent as to be negligible. There was some damage from needle cast (*Lophodermium* sp.); in Block A, 12.2 percent and in Block B, 0.4 percent of the trees were infested. In no case was the damage

severe enough to threaten the life of the trees. Cronartium rust was found on the lateral branches of trees on two plots in Block A but was not present in Block B. The shoe-string fungus (*Armillaria mellea*) was found on two plots in Block B but was not present in Block A. Damage was very light.

Cone Production

Jack pine begins to produce cones at an early age. Many of the trees in this planting are producing a limited number of cones (most of the trees raised from seed produced by trees with non-serotinous cones are showing that characteristic). However, open cones are not confined to this selection but seem to be quite general. This is often true of jack pine in the seedling stage since the cones are born at a point where the air temperature in summer is high enough to cause the cones to open. Probably no significant conclusions on the opening of cones can be drawn until the trees have passed the sapling stage.

Summary

Plantings of jack pine grown from seed collected from 32 locations in the United States and Canada were made at Cloquet, Minn., and some of the collections were tested further by inclusion in a planting at Austin, Minn.

In general, survival of all collections has been excellent and the plantings have developed sufficiently so that large differences in size and form are evident. The differences are so striking that there is no doubt regarding the existence of geographic races of jack pine that have very distinct growth characteristics. Jack pine can thus be added to the list of conifers for which distinct geographic races have been reported.

Plantings of northern origin, from northern Canada, are in general much slower growing at both Cloquet and Austin than plantings from seed collected nearer the southern limits of the range of jack pine.

The majority of the trees in the plantings, regardless of seed source, are at present of rather poor form. Some of this may be traced to the relatively wide spacing compared to conditions in stands of natural regeneration, but much is believed to be traceable to insect damage. Detailed records of insect damage are being kept; they indicate that such damage may be a determining factor when form is considered.

Trees grown from seed collected in Lower Michigan suffered severe winter injury during the winter of 1947-48.

The plantings have not developed to the point where it is possible to tell whether such characteristics as the possession of serotinous or non-serotinous cones is an inherited characteristic.

Literature Cited

1. BALDWIN, H. I. 1933. Importance of origin of forest seeds. Empire Forestry Jour. 12(2):198-210.
2. ———— and H. L. SHIRLEY. 1936. Forest seed control. Jour. Forestry 34:653-663.
3. HORN, A. G. 1948. Aspen takes lead as pulping species in Lake States. Lake States Forest Expt. Sta. Tech. Note. No. 288.
4. ISAAC, LEO A. 1949. Better Douglas fir forests from better seeds. Univ. Washington Press. Seattle.
5. MUNGER, T. T. and W. G. MORRIS. 1936. Growth of Douglas fir trees of known seed source. U. S. Dept. Agric. Tech. Bul. 537.
6. ————. 1942. Further data on growth of Douglas fir trees of known seed source.
7. PEARSON, G. A. 1914. Influence of the origin of seed. Proc. Soc. of Amer. Foresters 9:113-119.
8. RUDOLF, PAUL. 1948. Local red pine seed develops best plantations. Lake States Forest Expt. Sta. Tech. Note 296.
9. WAKELEY, P. C. 1950. Plant loblolly pines from local seed. Southern Forest Expt. Sta. Southern Forestry Note 66.
10. WEIDMAN, R. H. Evidence of racial influence in a 25-year test of ponderosa pine. Jour. of Agric. Research 59:12, 855-887.

The Cover

The cover photograph, taken by the Bureau of Entomology and Plant Quarantine, shows spraying to control an epidemic of the Douglas-fir tussock moth, *Hermerocampa pseudotsugata* McD., on 295,000 acres of infested Douglas-fir type in northern Idaho in 1947. The plane is a Ford tri-motor spray plane of the Johnson Flying Service, Missoula, Mont.—one of two spraying contractors. The scene is near Bovill, Idaho, about 4:30 a.m., June 21, 1947.

Aside from its dramatic nature, the photograph is an excellent portrayal of the action of the insecticide immediately after its discharge from the plane's spray booms. The violent spiralling action and gradual spreading of the spray is seldom seen, except from this angle.

Blister Rust Damage at Waterford, Vermont

P. L. Rusden[1]
Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, U. S. Department of Agriculture.

A PAPER entitled "Blister Rust Damage to Northern[2] White Pine at Waterford, Vermont" (*1*) was published in 1933. It describes the effect of blister rust on a stand of merchantable white pine from data obtained from examinations in 1925 and 1930. Since then, three additional inspections were made at 5-year intervals up to 1945. In the present paper the data from five examinations have been analyzed, and the changes caused by blister rust over a period of 20 years are shown. These changes greatly altered the value and composition of the stand. The observations reported here are pertinent at a time when there is a growing interest in woodlot management as an important phase of forest conservation (*2*), and when many of the more progressive woodlot owners are alert to the importance of controlling forest-tree diseases. Of these diseases, blister rust is of first importance to white pines.

The following brief resumé of the original paper will acquaint the reader with the background for the present study and with the damage caused by the rust through 1930.

The blister rust fungus, (*Cronartium ribicola* Fischer), first reported in North America from Geneva, N. Y., in 1906, was probably introduced from Europe about 1898. During the period 1900 to 1910, thousands of eastern white pines (*Pinus strobus* L.) were imported from European nurseries. This diseased stock was planted in over 200 locations in the Northeastern and Lake States, and from these centers the rust spread to wild and cultivated currant and gooseberry plants, commonly called ribes,[3] and from these bushes to natural and planted stands of eastern white pine from Maine to Minnesota. Since then, the disease in the East has spread southward to Georgia.

Blister rust was first introduced into northern Vermont on white pines imported from Germany about 1901. These trees were planted at Lyndonville, less than 15 airline miles from the pine woodlot at Waterford used in this study. By 1924 blister rust infections became very noticeable on the Waterford pines, and the study herein reported was begun. The original study included 25 acres of understocked young pasture pine. No detailed observations were made in this type after 1925, and this young pine will not be considered further at this time. There were 2.43 acres of mixed 60-year-old white pine, uneven-aged spruce and hardwoods, hereinafter designated as "the merchantable stand." The pertinent data from the study up to 1930 may be summarized briefly as follows:

1.—Both wild and cultivated ribes were found within infecting distance of merchantable pine. Cultivated ribes, probably *Ribes nigrum* L., located about 2,400 feet northwest from the merchantable stand were destroyed in 1917. The wild plants, the wedgeleaf gooseberry (*R. hirtellum* Michx.), and the skunk currant (*R. glandulosum* Grauer), in types surrounding the pine wood lot, were eradicated in 1925. The earliest identifiable pine infections were on wood formed in 1908.

2.—The merchantable stand in 1930 contained 416 pines, with 82.9 percent of the crop trees or 82.5 percent of all pines infected. This slight difference shows that there was no real significance to the noncrop classes. These percentages have been revised upward slightly from the figures published in 1933, because a number of the cankers were not recognized until 1935. By 1930, 24 percent of all pines, or 17 percent of the crop trees, had been killed by the rust.

3.—Pines in all height and diameter classes found on the lot were infected, and by 1930 representatives of all but the largest class were killed.

4.—By 1930, the basal area of dead and dying pines (total trees) was reported as 25 percent of the total basal area.

5.—The board-foot volume in dead or dying pines increased from 8 percent of total volume in 1925 to 23 percent in 1930, or 3 percent per annum. This did not include any estimate of increment lost because of killing.

6.—It was assumed that, when damage reached its maximum, 33 to 51 crop pines per acre would remain.

7.—Stumpage loss computed at $8 per thousand board feet was considered to be $19.86 per acre in 1930, and it was assumed that this would increase to a maximum of $112.16 to $139.18 per acre. This estimate did not allow for lost increment in killed trees.

In contrast to the original paper, the data herein are presented where possible on a per-acre basis. By this use of per-acre values the forester can compare the facts reported with any similar facts that form part of his background of experience without resorting to laborious conversions of figures. In this study, dominant and codominant trees are included as crop trees, since the pines in both classes produced salable sawtimber.

Source of Infection

In the first report on this study, it was pointed out that both wild and cultivated ribes were within infecting distance of the pines. It was believed then that the intensity of the infection would be attributed primarily to the cultivated ribes,

[1]Special credit is due to E. C. Filler, author of the original paper; to K. K. Stimson, who tabulated and checked the field data; and to C. C. Perry, who assisted in the preparation of the manuscript.

[2]By authority of the U. S. Forest Service Tree Name Committee, eastern white pine is the common name for *Pinus strobus* L. The species ranges south from Maine and Minnesota to Georgia and Alabama.

[3]The term "ribes" will be used herein to refer to the genus *Ribes* and will include all species of currant and gooseberry plants.

because in the 1920's many instances of heavy damage were definitely associated with exposure to the highly susceptible *Ribes nigrum*. However, it was later discovered that not many miles from the Waterford location, comparable serious losses occurred as a result of exposure to wild ribes only. Numerous similar instances have been noted in other states in the Northeastern region. It is reasonable to assume that in this study area, the heavy build up of the disease can be attributed to the presence of both wild and cultivated ribes.

Blister Rust Reduces Stocking

During the 20 years covered by this study, the infected pines underwent changes caused by the progress of the fungus in each diseased tree. At the time of the first reading in 1925, there were only 6 dead[4] crop trees per acre. The disease progressed from branch to stem and killed some additional pines each year, so that by 1945 there were 63 dead trees per acre, with a total loss to the stand of 50.8 percent of the crop trees.

In addition to the dead pines in 1945, there were 28 living crop trees per acre with cankers in the stems, and it was evident that these trees would die within a few years. Thus, the dead and "will die" pines represented a potential loss of 91 stems per acre, or 73.4 percent of the crop pines (Fig. 1).

Very little replacement by intermediates could be expected in a stand 60-80 years old. Actually there were only seven cases where replacements occurred and four instances where crop pines became overtopped; hence, there was a net change of less than two crop pines per acre over a period of 20 years.

The steady increase in the number of crop pines killed, from 6 in 1925 to 63 in 1945 (Table 1) shows that by 1945 blister rust had reduced the actual stocking of 124 crop trees per acre to 61, and threatened to remove at least 28 more.

[4] A pine classed as dominant or codominant prior to death was retained in that classification after death.

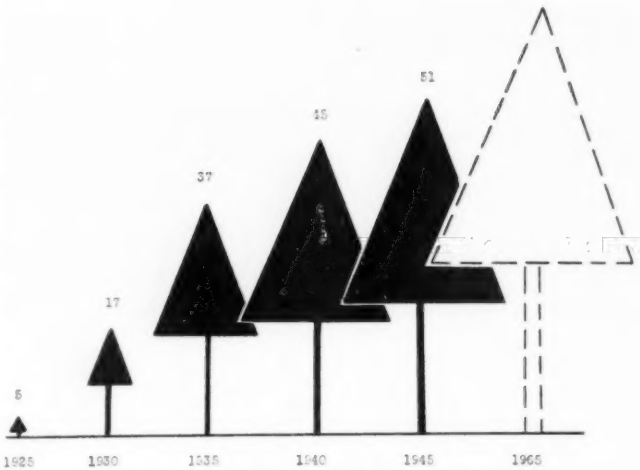


FIG. 1.—Percentages of crop pines killed and expected to be killed.

TABLE 1.—NUMBER OF PINES PER ACRE 1925 TO 1945

Condition	1925	1930	1935	1940	1945
Crop pines (dominant and codominant)					
Stem-cankered:					
Live	53	45	31	27	21
Top killed	8	12	9	6	7
Tree killed	6	21	45	56	63
Damage potential	67	78	85	89	91
Branch infection	35	24	16	14	12
Rust free	21	21	21	21	21
Dead, other causes					
Totals	123	123	122	124	124
Noncrop pines (Intermediate and Suppressed)					
Stem-cankered:					
Live	14	8	5	2	2
Top killed	9	7	3	2	1
Tree killed	9	20	29	34	35
Damage potential	32	35	37	38	38
Branch infection	7	4	3	1	
Rust free	9	9	7	6	6
Dead, other causes			2	2	3
Totals	48	48	49	47	47
All pines					
Stem-cankered					
Live	67	53	36	29	23
Top killed	17	19	11	8	8
Tree killed	15	41	75	90	98
Damage potential	99	113	122	127	129
Branch infection	42	28	19	15	12
Rust free	30	30	28	27	27
Dead, other causes			2	2	3
Totals	171	171	171	171	171

The reduction in pine stocking by the rust did not follow any regular pattern. In other words, the disease is not a reliable thinning agent for dense stands of pine. On occasion in pole stands, where dominance has not been fully expressed, blister rust attack may result in an approach to a desirable thinning. This does not occur, however, unless the ribes have been removed before the rust has had a chance to run its full course. The disease usually kills too many trees in one portion of the stand and not enough where thinning is needed. The rust also attacks and kills a higher proportion of crop than of noncrop trees. In poorly stocked stands this kill is disastrous.

FIG. 2.—White pines of all sizes infected and killed by blister rust in merchantable stand at Waterford, Vt. Degree of infection indicated by paint markings as follows: *1 band*, trunk canker—tree alive 1930, 1935, and 1940; *3 bands*, killed by blister rust up to 1930; *4 bands*, killed by blister rust up to 1940; *cross and band*, branch canker 1925—trunk canker 1930; *cross, band and dot*, branch canker 1930—trunk canker 1935. Photograph, 1940.

Delayed Action of Rust in Killing White Pines

This study illustrates strikingly the delayed action of the blister rust fungus in killing white pines, particularly older trees. With only six dead trees in 1925, the number increased slowly but surely, and in 1945 pines were still dying. At that time, 28 years had elapsed since 1917, when the cultivated ribes were destroyed, and 20 years since the final source of pine-infecting spores was eliminated by the eradication of the wild ribes. This delayed killing action is frequently misinterpreted as an indication of the ineffectiveness of ribes eradication as a control measure. This mistaken view is disproved emphatically in this study, where not a single canker originating after 1924 was found. The recognition of the slow action of the fungus is of tremendous importance to the forest manager and points to the need of a thorough training in the identification of blister rust cankers, as well as recognition of the importance of timely eradication of ribes. Adequate knowledge of the fundamentals of blister rust control will enable the forester to avoid the mistake of relying on certain trees in the stand as crop trees, only to find out too late that they are doomed by blister rust. When careful examination shows that the disease is present, it is advisable to leave from 10 to 15 percent more potential crop trees, to allow for delayed loss from the rust.

Rust Kills Pines of Any Size

This study began relatively late in the life of the stand, as most of the crop pines were in the 60-year age class. The growth data show a relatively stable stand, with little change in dominance. After 1925 very few trees died from suppression.

The six crop trees per acre that were dead in 1925 were from 31 to 60 feet tall, with diameters ranging from 3 to 14 inches. In 1945 there were some killed crop trees in all height classes from 21 to 80 feet and in all diameter classes from 3 to 26 inches. Although no trees in the 81- to 90-foot height class had died from rust, an average of seven of these pines per acre had stem cankers. The one tree in the 27- to 29-inch diameter class had a stem canker, showing that blister rust is no respecter of size. It requires more time to kill the larger specimens, but mature white pines are not safe because of their size alone (Fig. 2).

Basal Area As Affected by the Rust

In 1925 the crop trees had 93.895 square feet of basal area per acre, which increased to 150.590 by 1945. These figures (Table 2), however, include trees killed by blister rust and of no future value. This condition class shows an apparent increase only because more trees died each year. Using the healthy trees only, a theoretical crop-tree basal area per acre at the time of each data reading can be computed. In 1925 there were 21 rust-free crop pines with a basal area of 12.858 square feet, which by 1945 amounted to 27.830 square feet; a net increase of 14.972 square feet, or 0.7486 square feet per acre per year.

In theory, if blister rust had not attacked this stand, there would have been 124 rust-free crop trees per acre, that is, 5.9 times the number recorded. Therefore, the basal area would have been 75.862 square feet per acre in 1925, with a theoretical annual increment from 1925 to 1945 of 4.417 square feet per acre (5.9 times 0.7486). The actual basal area plus the theoretical would have reached 164.197 square feet by 1945. Since the adjusted

TABLE 2.—BASAL AREA IN SQUARE FEET PER ACRE 1925 TO 1945
Crop pines (dominant and codominant)

Condition	1925	1930	1935	1940	1945
Stem-cankered:					
Live	46.610	46.899	39.338	40.311	39.580
Top killed	4.346	11.962	11.173	6.666	8.500
Tree killed	2.572	12.201	33.948	47.324	54.539
Damage potential	53.528	71.062	84.459	94.301	102.619
Branch infection	27.507	24.438	19.372	19.018	19.477
Rust-free	12.858	16.155	19.283	23.232	27.830
Dead, other causes					.661
Totals	93.893	111.655	123.114	136.551	150.587

basal area per acre for living crop trees in 1945 was only 95.390, the loss from blister rust amounted to 68.807 square feet, or 41.9 percent (Fig. 3).

Rust Affects the Board-Foot Volume of Crop Pines

For each pine the diameter at breast height to the nearest tenth inch and the total estimated height to the nearest foot were recorded at the time of each examination. With the aid of the volume table[5] prepared by Louis Margolin, of the U. S. Forest Service, published in *Management of Farm Woodlots* by J. H. Foster, state forester of New Hampshire (*3*), the usable wood volume of each pine was computed. The board-foot volume per acre for the various condition groups is given in Table 3.

The proportions of board-foot volume in each condition class for the crop pines show the shifting of volume from group to group as fatalities increased. There was a small but steady increase in the total wood volume for rust-free pines.

On the basis of live crop trees per acre, the stand showed an increase of 5,521 board feet from 1925 to 1945. The net increment for the 20-year period was, therefore, 276 board feet per acre per year. If the pines had not been killed, their continued growth naturally would have added to the total volume of the stand. It is logical, therefore, to add this normally expected increment to the volume of the dead pines, to arrive at the total measure of the loss from the blister rust attack.

To this end, volumes were computed from the original field data for the trees that remained continuously in the three condition classes. The average increment throughout the 20 years was determined to be as follows:

	Board feet
Rust-free	10.24
Branch-infected	12.10
Stem-infected, live	13.21
Average	11.85

[5]Volumes based on actual saw cut with ¼ inch kerf, 60 percent round edge, and 40 percent square edge. Seventy percent cut into inch boards and 30 percent into 2 ⅜ inch plank.

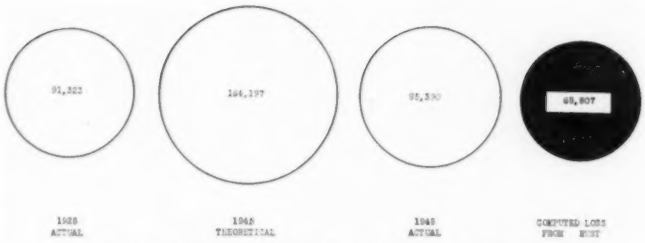


FIG. 3.—Basal area per acre (in square feet) for live crop trees.

TABLE 3.—BOARD-FOOT VOLUME PER ACRE 1925 TO 1945
Crop pines (dominant and codominant)

Condition	1925	1930	1935	1940	1945
Stem-cankered:					
Live	8,362	8,626	7,989	8,537	8,877
Top killed	677	2,073	2,030	1,241	1,678
Tree killed	343	1,977	5,919	8,408	9,879
Damage potential	9,382	12,681	15,938	18,186	20,434
Branch infection	4,848	4,494	4,052	4,206	4,679
Rust-free	2,106	2,692	3,701	4,607	6,280
Dead, other causes					
Totals	16,336	19,867	23,691	26,999	31,393

TABLE 4.—NET HARVESTABLE BOARD-FOOT VOLUME PER ACRE AND THEORETICAL LOST INCREMENT IN KILLED CROP PINES PER ACRE

Year	Dead-tree volume at time of death	Theoretical accumulated lost increment for dead trees	Theoretical total volume possible for dead trees	Live tree volume	Theoretical total volume for all crop trees	Percentage loss from rust
1925	343	300	643	15,993	16,636	3.9
1930	1,977	1,350	3,327	17,890	21,217	15.7
1935	5,919	3,600	9,519	17,772	27,291	34.5
1940	8,408	6,400	14,808	18,591	33,399	44.3
1945	9,879	9,550	19,429	21,514	40,943	47.5

The rust-free trees show 13.6 percent less increment than the average live crop tree, simply because the rust succeeded in attacking the more vigorous crop trees. This is not unusual. There is no implication that the rust stimulates the infected trees.

It is conservative to assume from these figures an annual increment of 10 board feet for each killed tree, had it remained alive. Table 4 shows what this *lost increment* amounted to during the period, and Figure 4 shows graphically the comparison between volumes of actual and theoretical wood. In the computations each killed tree was considered to have been dead for 5 years at the time it was first observed to be dead.

Table 1 shows an increasing number of rust-killed crop pines at each reading. After 1935 there was a decrease in killing rate as the disease progressed more slowly in the larger boles. By 1945 the 63 crop pines per acre dead from rust had accumulated 9,879 board feet of wood before they died. If it is assumed that all trees recorded as dead in 1925 had been dead for 5 years, then all trees recorded as dead in 1945 had been dead from 5 to 25 years. If an increment of 10 board feet per annum per tree after death is added, by 1945 the loss would have amounted to 9,550 board feet of wood per acre for the 63 pines, or a theoretical total of 19,429 board feet per acre that could have been produced by these trees had they been rust-free. Since 21,514 board feet of wood per acre were recorded for live crop pines in 1945, with the increment added a total of 40,943 board feet could have been produced on each acre. The percentage loss in dead pines, because of the blister rust attack was 47.5. If, however, the volume in top-killed and stem-cankered-live

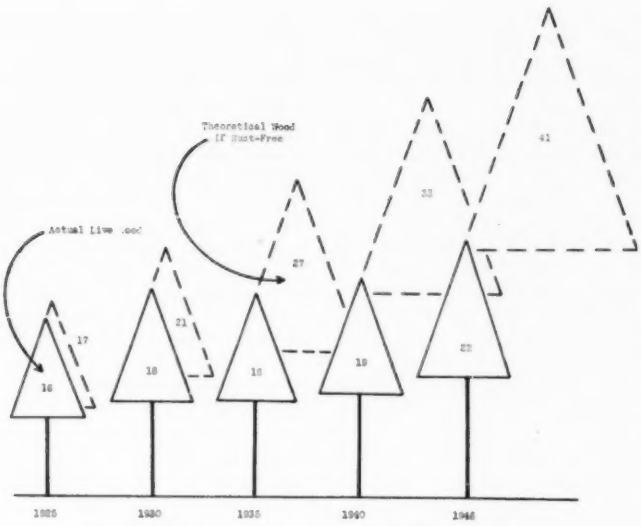


FIG. 4.—Crop pine volumes in thousands of board feet per acre.

TABLE 5.—COMPARISON OF ACTUAL AND THEORETICAL PER ACRE VALUES AT $10 AND $15 PER M BOARD FEET

Year	Actual live wood		Dead plus theoretical live wood		Loss from blister rust	
	$10	$15	$10	$15	$10	$15
1925	$159.93	$239.89	$166.36	$249.54	$ 6.43	$ 9.65
1930	178.90	268.35	212.17	318.26	33.27	49.91
1935	177.72	266.58	272.91	409.37	95.19	142.79
1940	185.91	278.87	333.99	500.99	148.08	222.12
1945	215.14	322.71	409.43	614.15	194.29	291.44

trees (Table 3) is added to the theoretical total volume in the killed trees (Table 4), the combined figure of 29,984 board feet per acre represented an apparent potential loss of 73.2 percent, in the absence of salvage.

Table 5 compares the actual live-wood value with the theoretical value on a per-acre basis at $10 and $15 per thousand board feet and lists the losses from killed trees at each examination. Figure 5 shows the comparison graphically. The computations show that if blister rust had not attacked these pines, the stand at $10 per thousand board feet would have brought $409.43 per acre, instead of $215.14.

At the present time, $10 is not a high stumpage figure, since much higher rates have been paid in several sections of the Northeast. Clients of the New England Forestry Foundation (*4*) in 1950 obtained stumpage prices ranging from $7 to $25, with an average of $13.26, as compared with an average of $11.18 in 1949. Stumpage prices are more likely to rise than to decline in the future; therefore, the computations at $15 have been included.

Since heavy infection of the pines was an accomplished fact in 1925, because of the presence of ribes up to that time, there remained but one step that could have been taken to secure the greatest yield of timber. A close watch could have been kept, and all trees nearing death from blister rust could have been salvaged. This practice would have required cutting a few trees at a time, but in the aggregate could have saved most of the 9,879 board feet per acre that was lost in killed crop trees. Even with such procedure, there would still have been the loss represented by the potential increment in the salvaged infected trees.

This lot was set aside for study to obtain data on rust damage, and no salvage cutting was allowed. A clear cutting of the stand in 1925 would have grossed $159.93 per acre at $10 stumpage. By 1945 the return would have been $215.14 per acre at $10 stumpage or an increase of $55.21. Careful salvage of the 9,879 board feet per acre by taking out single trees or small groups before the rust killed them would have added $9.88 more per acre at the same stumpage price. Thus, $65.09 per acre over the 1925 return could have been gained by waiting the 20 years, but salvaging all dying crop pines in the meantime. The economic factor of fluctuating values confuses the picture, since by 1945 the stumpage value was much higher.

The important point from all this is clear—keep blister rust out of pine areas. This can be done in the Northeastern Region for a few cents per acre per year (*5*). Another point is clearly indicated—have a plan of management for every pine lot, with protection from blister rust as one of the first items.

This stand was unique in that its development was followed closely during the final 20 years of its existence. The theoretical increase in volume would have been 24,307 board-feet per acre, or an increment of 1,215 board feet per acre per year during the 20 years from age 60 to 80. Thus, 59 percent of the total volume of 80-year old pine can accrue in the last 25 percent of its life span. Here is the basis for an argument in favor of an 80- to 100-year rotation for eastern white pine. The stand was logged in 1948 and the live-crop trees were very sound. Under ordinary circumstances it is realized that the owner of a small timber holding might have a greater interest in a shorter rotation with a smaller cash return during his lifetime.

Blister Rust and Stand Composition

In the original paper the Waterford wood lot was described as "a 2.43-acre mixed stand of 60-

year-old white pines, uneven-aged spruce, and hardwoods." The stand had 673 trees more than 6 inches d.b.h. in 1930 and 52 percent of these were white pines. Thereafter no attempt was made to follow the development of species other than white pine. However, the composition was studied on two ¼-acre plots that had been selected to show the effect of the rust on the best merchantable pines.

In 1945 on the two ¼-acre plots there was a population of 45 trees, or 90 stems per acre other than white pine. The contribution of spruce, fir, maple, and birch was not significant. These other species for the most part consisted of weak, suppressed, understory trees, giving to the casual observer a false appearance that they were actually in real competition with the pines. Their small diameters and weak growth showed the facts to be otherwise. The only really significant growth on the site was made by white pine. The absence of white pine reproduction resulted from the closing of the stand.

Factors Contributing to Blister Rust Damage

A review of the circumstances of blister rust infection in this woodlot, indicates that two major factors have been responsible for the loss of pine volume. The rust made serious inroads in the pine and no forest-management plan was in operation. The only steps taken to secure the stand against loss were (1) the elimination of cultivated ribes in 1917, (2) eradication of wild ribes in 1925, late in the life of the stand, and (3) a clear cutting in 1948.

The first two steps prevented new rust infection from reaching the trees after 1924. The third step salvaged the living wood in 28 crop trees per acre that were doomed by the presence of definite stem cankers. There were 12 additional crop pines per acre with branch infections, but it is doubtful if many more of these would have become fatal.

Two factors, the rust and lack of management, together resulted in a loss of more than $190 per acre at $10 stumpage. Timely blister rust control plus a management plan calling for salvage cuttings could have been put into effect at a reasonable cost.

Similar heavily infected woodlots in many parts of the commercial range of eastern white pine were not unusual in the 1920's. Most of these stands were not under any form of management. In many of them large losses of rust-killed timber occurred before the extent of rust damage was realized.

The other side of the picture, namely, protection against new rust infection, has been much brighter. White pine blister rust control has been established and is being maintained on about one-half the white pine forests in the United States (*6*). This has been done and is being continued through the cooperation of private woodland owners, towns, counties, states, and federal agencies, all working together in a coordinated plan to reduce the danger from blister rust to a minimum. Continued active cooperative effort on the part of all concerned with the production and use of white pine timber will ensure a future crop of this valuable wood from trees free from the ravages of the white pine blister rust disease.

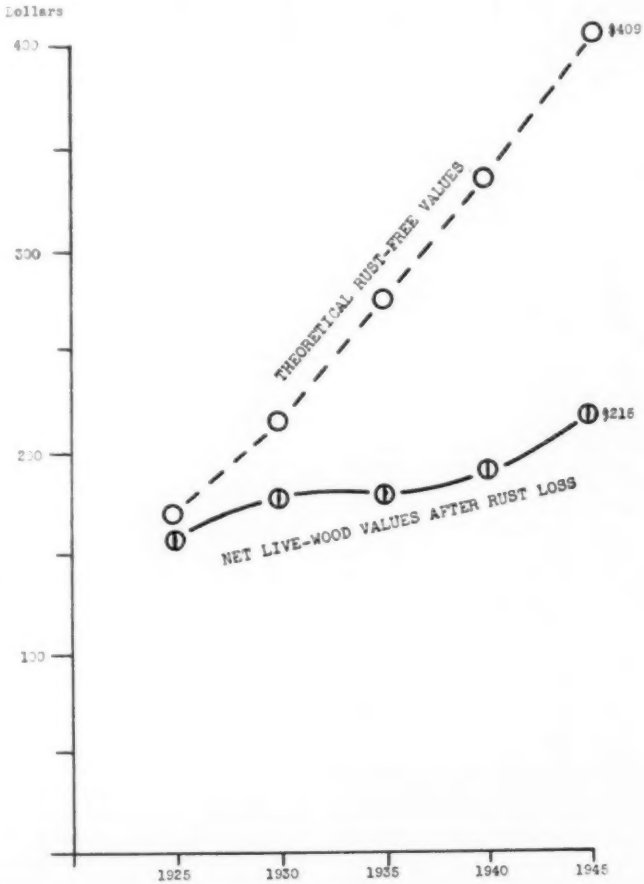


FIG. 5.—Dollar values per acre for crop pines at $10 per thousand board feet.

Intensive logging, particularly during the years since 1939, has complicated the blister rust control problem in the Northeastern region by opening up thousands of acres of land to the simultaneous production of white pines and ribes. This paper deals with the delayed killing effect of the rust in a stand 60 to 80 years old. In very young stands, especially if they are understocked, the progress of blister rust damage is frequently rapid. A young pine growing in the vicinity of rust-bearing ribes is almost certainly doomed. In fact, control of the rust is very important because, in many instances, the disease prevents the development of adequate pine reproduction. Active cooperation for the establishment and maintenance of control is needed more than ever to counterbalance the serious drain of pine timber that has taken place since 1939.

Summary

Data from five examinations in a typical farm woodlot having 2.43 acres of merchantable eastern white pine heavily infected with blister rust are analyzed in this paper. A resumé of a paper published in 1933 is presented, and the observations over the 20-year period from 1925 to 1945 are discussed. It is shown that the rust situation was actually worse than could have been known with certainty in 1930 and, in particular, it is pointed out that the early estimates of loss did not take into consideration the potential livewood increment for killed trees. This report represents the longest series of white pine blister rust observations available for eastern white pine.

The outstanding disclosures from the study can be summarized as follows:

1.—The stand was relatively static as early as 1925, and very little replacement of lost dominant or codominant pines took place. No serious consideration was given to the nonerop component of the stand.

2.—The rust is definitely not a reliable thinning agent for a mature stand such as this, since 73.4 percent of the crop pines were doomed and certain to have died had not the stand been logged in 1948.

3.—White pine blister rust is no respecter of size. Crop pines in all represented height classes were doomed by the rust, but the larger trees are killed more slowly. The delayed action of the rust in killing pines was strikingly illustrated.

4.—By 1945 there was a loss of 41.9 percent of the basal area of crop pines. This was based on the probable basal area using healthy crop pines as a gauge. The basal area for live crop trees in 1945 was 95.390 square feet per acre, but could have been at least 164.197 square feet in the assumed absence of the rust.

5.—By 1945 there were 98 pines per acre (63 crop and 35 nonerop) killed by the disease, with a potential of 91 crop pines per acre dead or sure to die, or 73.4 percent of the crop stems.

6.—In 1945 there were 31,393 board feet per acre in crop trees. Of this total, there were only 21,514 board feet in living trees. If an increment of 10 board feet per annum per tree for the 20 years is assumed, the dead trees should have contributed an additional 19,429 board feet per acre for a crop total of 40,943 board feet. The loss in killed trees was, therefore, 47.5 percent of the crop volume. Without salvage, the apparent volume loss including killed, top-killed, and stem-cankered-live pines would have been 73.2 percent.

7.—At $10 stumpage the loss from blister rust would have been $194.29 per acre, or $291.44 per acre at $15 stumpage, allowing for lost increment in the crop pines actually killed by the disease. Thus, loss from blister rust can cost the owner several dollars per pine acre per year.

8.—The growth data show that 59 percent of the volume in 80-year-old pine can accrue during its last 20 years.

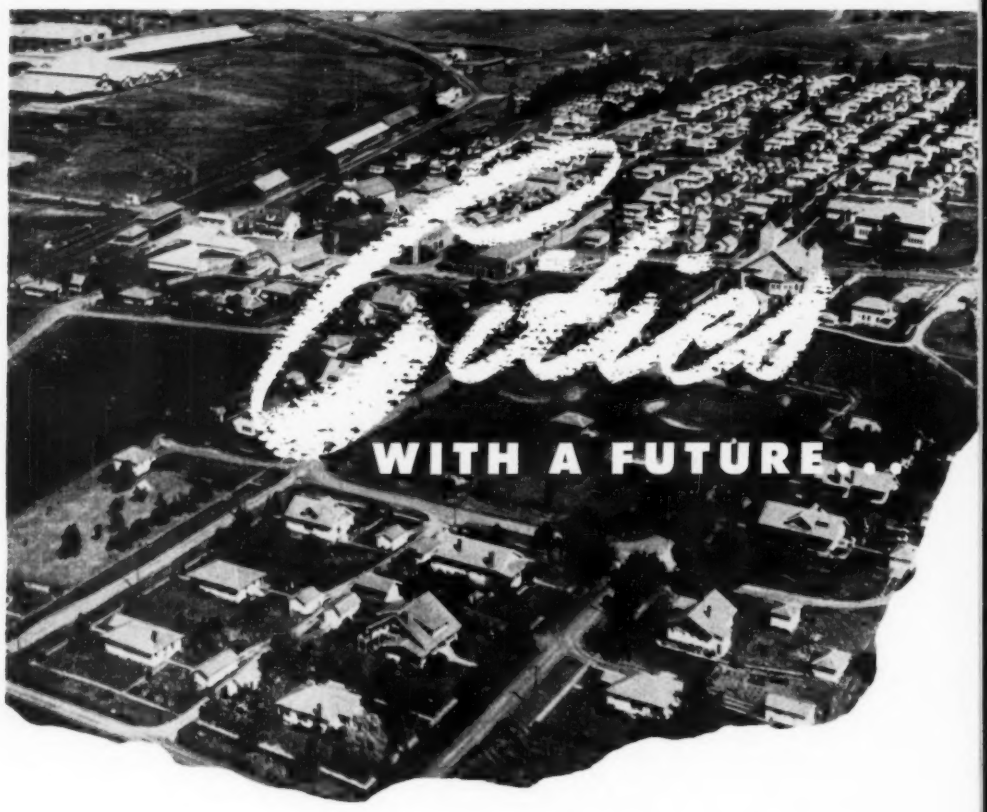
9.—Special ¼-acre sample plots within the merchantable stand show the stability of the stand and the predominance of white pine.

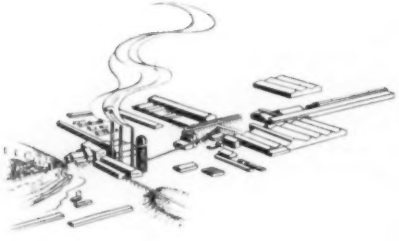
10.—Two steps are essential to minimize damage to a pine stand where blister rust is already prevalent: (1) Destroy all ribes plants within and adjacent to the stand and (2) follow a plan of silvicultural management that includes a provision for the salvage of blister rust infected crop trees before their death from the rust makes them a total loss.

11.—Continued active cooperative effort on the part of all concerned with the production and use of eastern white pine timber is needed to ensure a future crop of valuable wood from trees free from the ravages of the white pine blister rust disease.

Literature Cited

1. FILLER, E. C. 1933. Blister rust damage to northern white pine at Waterford, Vt. Jour. Agr. Res. 47 (5):297-313.
2. FEDERAL RESERVE BANK OF BOSTON. 1949. Wooden dollars. Boston, Mass.
3. FOSTER, J. H. 1922. Management of farm woodlots. State Forestry Com. Concord, N. H.
4. NEW ENGLAND FORESTRY FOUNDATION. 1950. Report of the secretary. Boston, Mass.
5. PERRY, C. C. 1929. Cost of blister rust control work. Jour. Forestry 27 (1):50-54.
6. MARTIN, J. F. and PERLEY SPAULDING. 1949. Blister rust on white pine. U. S. Dept. Agric. Yearbook: 453-457.





VISITORS WELCOME
GUIDED TOURS

About 1900, increased demand for White Pine lumber resulted in construction of what is now the Potlatch Unit of Potlatch Forests, Inc. For many years this plant was the largest of its kind in the world. Today, after fifty years of operation, the mill still produces record volumes of quality lumber from Idaho White Pine, Fir, Larch and Cedar. These species grow intermingled on forest lands adjacent to the mill property.

POTLATCH, IDAHO

Nestled in rolling hills of the great Palouse area of the Pacific Northwest, next door to some of the finest timber growing lands in America, is the city of Potlatch, Idaho.

Here, fifty years ago, a group of farsighted lumbermen decided to build a sawmill and a town. Proof of their good judgment is the city of Potlatch today . . . an active and thoroughly modern community.

Potlatch residents live in hundreds of modern homes. They have a large, well-equipped hospital and enjoy splendid educational and recreational facilities. This well-managed city offers many services . . . hotel, garage, theatre, bank and up-to-date stores. Its people worship in churches of their choice.

Policy of Potlatch Forests, Inc., now as always, is the intelligent production of quality forest products from timbered lands that guarantee a bright tomorrow for this city with a future.

Weyerhaeuser
SALES COMPANY
ST. PAUL 1, MINNESOTA

WEYERHAEUSER
TIMBER IS A CROP
FOREST PRODUCTS

Deterioration of Site Quality by Erosion

Joseph Kittredge
Professor of forestry, University of California, Berkeley.

When erosion reaches the stage of noticeable gullies, the site indexes of plantations of black locust and of loblolly, slash and shortleaf pines are heavily reduced in comparison with plantations on old fields, doubtless also eroded but not to the gully stage.

MANY PLANTATIONS have been and will be established on old fields more or less deteriorated and of which the site quality is not easy to determine. The presence of gullies, several inches deep, is readily observed and the significance of such observations in estimating the degree of deterioration of site quality is indicated by the following site indexes from plantations of the southern pines in the oak-pine region of the Carolinas, Georgia, Alabama, Mississippi, Tennessee, and Louisiana. Plantations of black locust were examined in Wisconsin, Ohio, and New York as well as in the southern states. Dominant heights and ages were determined for 134 plantations from 5 to 15 years old wherever they had been planted at least in part as a step toward rehabilitation of the soil. Site indexes at 50 years were read from the graphs for southern pines (*7*) and black locust (*5*). A few plantations included adjacent areas with and without gullies and these comparisons of site indexes from otherwise identical or closely similar sites tend to confirm those from the more numerous and more diverse sites.

The removal by sheet erosion of 25 percent of the A horizon of the soil of three soil types in South Carolina resulted in a 10-foot reduction of site index for loblolly pine reported by Cooper (*1*). The difference in site index of loblolly and shortleaf pine plantations on severely and slightly eroded sites in the Copper Basin of Tennessee was not over three feet using Allen's data (*1*). Perhaps "slight" erosion in the Copper Basin was only slightly less severe than the "severe." My records for two older plantations of loblolly pine in the Copper Basin show site indexes of 65 and 82 respectively for sites with and without gullies, a difference of 17 feet.

A slope which has eroded to the extent of having small gullies has also been subject to sheet erosion during and prior to the formation of the gullies. The old fields on which the plantations without gullies were growing, had been abandoned in most cases because their productivity had been reduced by loss of top soil by sheet erosion. The sites with gullies therefore represented in addition to the gully erosion a decidedly more advanced stage of sheet erosion than those without gullies.

The deterioration of site quality indicated by the reductions in site index values as a result of erosion to the gully stage in comparison with sites unquestionably impoverished by sheet erosion as shown in Figure 1 and Table 1 is surprisingly great. The means in Figure 1 are the tops of the bars. The species in Table 1 are arranged in descending order of the difference in mean site index for all plantations. Shortleaf pine showed the largest reduction — 37 feet — followed by slash pine with 30 and loblolly pine with 23. These three differences were highly significant statistically nothwithstanding the wide dispersion of individual values shown in Figure 1 and attributable to differences in soil, slope, rainfall, and other variables. Where variation associated with these factors was minimized by comparing different parts of the same plantations with and without gullies as paired data, the differences in mean site index are even larger, from 38 for shortleaf to 46 for loblolly pine. The value of these differences within plantations is chiefly to indicate that the differences derived from the more numerous data are almost certainly conservative. The seriousness of erosion when it is allowed to reach the gully stage in reducing the productivity of land for the growth of the southern pines may be indicated by translating site indexes into yields. The reductions would amount to 20,000 or 30,000 board feet per acre at 50 years.

The site index values for the three pines on sites without gullies are much higher than average for the region. Errors in determinations of heights or ages are not believed to be a cause. The numbers of trees per acre in the plantations were quite similar to those in the yield tables so that stocking is probably not a cause of the high site index values. Almost all the plantations were on old fields. Stands on old fields were avoided in the preparation of the yield tables and site index curves "because the high quality of the site apparent in the first decade or two deteriorates in time" (*7*). The height growth of pines on old fields in the Lake States was 1½ to 3 times that on other sites in plantations less than 20 years old (*6*). The old field sites are doubtless one reason for the high site index values. The plantations measured were less than 20 years old. The site index curves were derived

TABLE 1.—COMPARISON OF MEAN SITE INDEXES OF PLANTATIONS ON SITES WITH AND WITHOUT GULLIES

Species	Gullied	No gullies	Difference all data	Difference paired data
	Mean site index			
Shortleaf pine	49	86	37[1]	38[1]
Slash pine	62	92	30[1]	45[1]
Loblolly pine	93	116	23[1]	46[2]
Black locust, southern	34	50	16	
Black locust, northern	60	74	14	61[3]

[1]Difference is highly significant.
[2]Difference is significant.
[3]Only one pair.

from stands over 25 years old and their use becomes less reliable as they are applied to younger stands. For this reason also the site index values may be too high as indicators of merchantable yields.

The deterioration of site by erosion is measured by the differences in site index between sites with and without gullies. Although the trends of the curves may not be representative of old fields, the site index values in both cases were derived from the same curves. Thus the differences are likely to be reliable even if the absolute values are too high to be applicable to older stands. The difference in yield of 20,000 board feet at 50 years mentioned above would be reduced by only about 3,000 board feet if the site index values for loblolly pine, for example, were reduced by 30 feet to 86 and 63, so that the difference of 23 feet at 50 years remained the same. The evidence of serious deterioration is still strong.

Will these deteriorated sites in young pine plantations improve in quality as the stands approach merchantable size? Slight increases in exchangeable calcium, pH and depth of A_1 horizon and slight decrease in organic matter in the surface 2 inches of mineral soil as a result of 15 years' growth of a loblolly pine plantation were found by Broadfoot (*2*). The litter showed increases also in nitrogen and excess base. Similarly, Coile (*3*) found little or no improvement in the soil of abandoned fields in the 20 or more years after occupation by loblolly pine until dogwood, red gum, and other deciduous species, more favorable in their influence on soil productivity, became established. In general it may be suggested that the pines which are notably low in their content of nitrogen and other nutrients are not likely to enrich soils also low in nutrients at rates sufficiently rapid to restore their productivity until the hardwoods of the next stage in succession add their litter to the soil.

The site index values for different species give an indication of the comparative growth in height of the dominant and codominant trees to an age of 50 years. The differences between species in Table 1 are quite large whether on sites with or without gullies. Loblolly pine grows most rapidly, followed by slash and shortleaf pine in that order. However, other factors are more important than growth in the rehabilitation of eroded sites. They are correlated with the growth and include the crown closure, coverage, and depth of forest floor. When the age of crown closure is classified according to site index, the following scale of ages applies to all three species of pine.

Site index class	40-50	50-65	70-80	80-100	100-125
Age of crown closure	12	9	7	6	5

After 7 years, the percentage of area covered by litter for all three species is over 85. In depth of forest floor, loblolly pine plantations averaged about 1 inch after 7 years and the other two pines about 0.5 inch. In these respects, loblolly is the most desirable species.

Black locust in the southern states showed less reduction in site index than the pines, and still less in the northern states. The differences of 16 and 14 feet in the means are not quite significant statistically, but means from a larger number of locust plantations would probably show significant differences. The one plantation where parts with and without gullies could be compared showed a difference of 61 in site index, doubtless an extreme example of what deteriora-

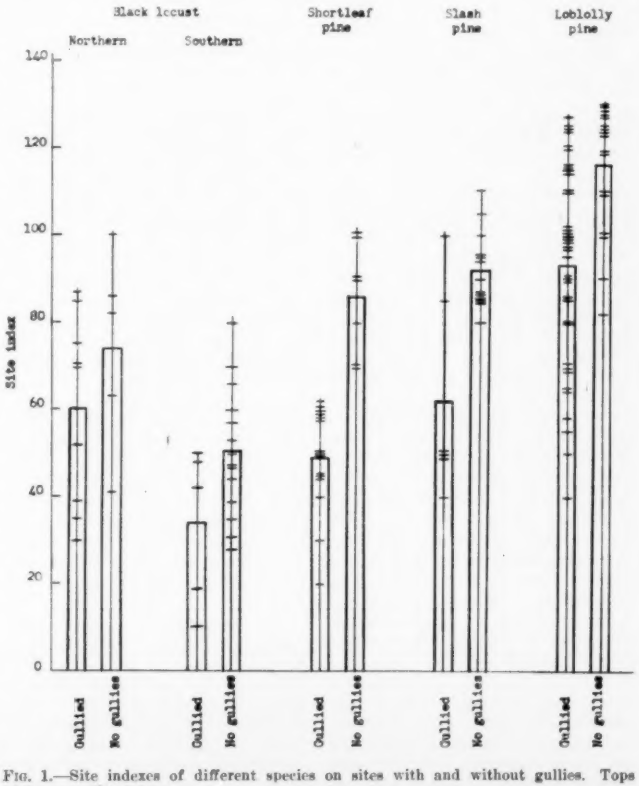


FIG. 1.—Site indexes of different species on sites with and without gullies. Tops of bars are the means.

tion may result from gully erosion. The relatively small differences in the means for the black locust compared with those for the pines may reflect the ability of the locust to obtain nitrogen through its root nodules and thus compensate in part for the small amounts of nitrogen, probably a limiting factor in the gullied soils. Although the reduction of site index is only slightly greater in the southern than in the northern states, it is interesting that the actual site indexes for locust in the southern states are so much lower than those in the northern. This corresponds to the usual conclusion that the eroded soils of the old fields in the oak-pine region with a compact impervious clayey horizon near the surface are such poor sites for black locust that a plantation may never produce a crop of fence posts.

In conclusion it may be suggested that sites in the oak-pine region on which erosion has developed to the gully stage are usually so seriously deteriorated that plantations of pines will grow only slowly although they will control the erosion. Loblolly pine is the best of the three species in both respects.

Literature Cited

1. ALLEN, J. C. 1950. Pine planting tests in the Copper Basin, Jour. Tenn. Acad. Sci. 25:199-216.
2. BROADFOOT, W. M. 1951. Soil rehabilitation under eastern redcedar and loblolly pine. Jour. Forestry 49: 780-781.
3. COILE, T. S. 1940. Soil changes associated with loblolly pine succession on abandoned agricultural land of the Piedmont Plateau. Duke Univ., School of Forestry, Bul. 5.
4. COOPER, W. E. 1942. Forest site determination by soil and erosion classification. Jour. Forestry 40:709-712.
5. KELLOGG, L. F. 1939. Site index curves for plantation black locust. Central States Region. U. S. Forest Serv. Central States For. Exp. Sta., Sta. Note No. 36.
6. KITTREDGE, J. 1929. Forest planting in the Lake States. U. S. Dept. Agric. Dept. Bul. 1497, p. 51.
7. U. S. OFFICE OF FOREST EXPERIMENT STATIONS. 1929. Volume, yield, and stand tables for second-growth southern pines. U. S. Dept. Agric. Misc. Pub. 50.

Support Urged for International Grass Congress

Members of the Society of American Foresters have good reasons to work for the success of the Sixth International Grassland Congress which will be held at The Pennsylvania State College, State College, Pa., August 17-23, 1952.

It will be a historic event for several reasons: first, the International Grassland Congress has never been held in the United States; second, it fits directly into the plans of the National Grassland Program which was launched last year by the U. S. Department of Agriculture, land grant colleges and universities, scientific societies, and trade associations. Another reason grasslands are most important just now is that with the tremendous increases in the world population, more and more concern is being directed toward overcoming food shortages.

The world's foremost scientists and leaders in grassland agriculture will bring the latest research and educational programs designed to give further impetus to grassland in a sound farming program. They will focus attention on grasslands for (1) a more balanced agricultural economy; (2) conservation of soil and water resources; and (3) a more abundant production of meat and livestock products. By achieving the goals of the Congress, the research and educational leaders of the world concerned with grassland farming will make a definite contribution toward building the national economic strength of their respective nations.

The interest and personal efforts of many of the nation's leading scientific and agricultural organizations and trade associations are being mobilized to insure the success of the Congress which is being sponsored by the U. S. government and the Food and Agriculture Organization of the United Nations. Government funds are being used to finance the major costs of the Grassland Congress, leaving a small but important financial responsibility to individuals and business to provide the balance of the budget.

The Finance Committee, headed by Wilbur G. Carlson, Milwaukee, Wisconsin, is actively enlisting the support of business and industrial leaders throughout the country. The committee is seeking to give opportunities to individuals and American business to be identified with and contribute to a program which they believe to be in the best interest of the national welfare.

"The responsibility of the Finance Committee is not great in terms of dollars and cents," Mr. Carlson said. "However, we are vitally concerned with financing that portion for which the Government has not appropriated funds. Our concern for the success of the meeting is shared by some of the nation's leading scientific organizations and trade associations, their members, and many other segments of private industry who are giving unselfishly of their time and energies to build a more sound and prosperous agriculture both at home and abroad."

In many areas of the world, including the United States, grasslands provide a great undeveloped resource which can be used to increase the production of food. Practically speaking, the Sixth International Congress will provide an opportunity for scientists and technicians from various parts of the world to exchange information concerning the production, improvement, management and use of grassland. Approximately 65 countries have been invited by the United States government to participate in the Congress. The Organizing Committee expects an attendance of approximately 2,000 to 2,500 specialists from the United States and other countries.

Financial contributions to the Congress are tax deductible and should be made payable to the Treasurer of the Sixth International Grassland Congress and mailed to:

Mr. Wilbur G. Carlson, Chairman,
Finance Committee,
Sixth International Grassland Congress,
Room 1049,
1778 Pennsylvania Ave. N. W.
Washington 25, D. C.

Notes

A Method of Transplanting Small Shallow-Rooted Trees

When a windbreak was to be planted on an experimental farm Norway spruce 15 years old and 5 to 10 feet in height were available within a few miles. Time and labor for transplanting them were limited, however. Accordingly, the orthodox shovel technique was slightly modified, using material and equipment available on many farms.

The trees had been spaced 2 to 4 feet apart in 6 feet rows. The major lateral roots were cut with a shovel about 18 inches from the trunk and the trees lifted with a tractor-mounted manure loader. Since the loader bucket could not dig downward appreciably a hole was dug at the beginning of each row to start the bucket below root level. As the loader progressed down the row each tree with its attached roots and 2 to 3 cubic feet of soil was lifted and set on a square of burlap on a flat-bed tractor trailer. By using the burlap corners as handles the trees were later placed in planting holes without additional disturbance.

Meanwhile, hand excavation of holes on planting sites proved difficult since most of them occurred either in an old hedge row or on exposed compact subsoil. Accordingly, dynamite was used, one-half stick per hole at a depth of about a foot; the soil was not badly scattered and only a small amount of additional shovel work was required to prepare the hole.

After planting, the holes were filled with reasonable care and packed to obtain continuous soil contact. A slight dike was raised on the downhill side to retain water. The trees were pruned to remove one-third to nearly one-half of the needle surface, taking care to maintain tree form and strong lower branches, and well mulched with old hay. A severe drought occurred during the summer and trees were watered twice using the tank, pump, and hose from ordinary spray equipment.

Of 70 trees moved, only one died—and that had been planted in saturated soil. Recovery of the remainder has been excellent and after two growing seasons the trees have now set large winter buds and appear ready to resume vigorous growth. No records were kept but total costs for labor, equipment rental, and materials are estimated at less than one dollar per tree.

E. L. Stone, Jr., and
R. B. Musgrave,
Department of Agronomy,
Cornell University,
Ithaca, N. Y.

A Table of Production Rates for Cutting Spruce and Fir Pulpwood

In planning pulpwood operations, the wood manager may have a choice as to method of cutting, intensity of cutting, size of crew, length of job, job organization, and so on. In reaching a decision he usually estimates production rates for different combinations of these factors.

As an aid for this planning job, the Northeastern Forest Experiment Station has compiled a table of production rates for cutting spruce and fir, by tree-diameter classes (Table 1).

The table is based on time studies of five commercial pulpwood operations in the Northeast. D.b.h. classes were used because, of all the factors that influence production—topography, tree size, species, weather, crew efficiency, job organization—the factor that was found to exert the greatest influence is tree size.

The records for skidded wood are from partial-cutting operations. The figures show total time required to get wood from standing trees to piles at a yard, using horses for skidding. If the yard is on a truck road, no sledding time need be added.

The records for stump wood are from a clear-cutting operation. The figures show total time required to get wood from standing trees into piles near where the trees were cut. Sledding time to a truck road must be added.

To use these production rates, the woods manager needs to know only the volume of spruce and fir to be cut, by diameter classes. The production time for each diameter class is found by multiplying the number of cords to be cut in that diameter class by the production rates (Table 1) for that class.

This holds true regardless of the cutting method used—clear-cutting, diameter-limit cutting, or selective cutting.

The average man-hour requirement per cord can be worked out by dividing the sum of production times for all diameter classes by the total volume to be cut.

The production-rate table is

Table 1.—Production Rates for Cutting Spruce and Fir Pulpwood
(In man-hours per cord)

D.b.h. class	Skidded wood		Stump wood	
	Rough	Peeled	Rough	Peeled
		SPRUCE		
5	9.63	14.16	5.83	9.42
6	7.25	11.06	4.68	8.20
7	5.76	8.95	4.15	7.17
8	4.93	7.64	3.79	6.30
9	4.51	6.79	3.46	5.60
10	4.23	6.20	3.27	5.03
11	4.05	5.80	3.06	4.61
12	3.95	5.51	2.85	4.30
13	3.81	5.27	2.71	4.02
14	3.71	5.08	2.59	3.80
15	3.62	4.93	2.49	3.68
16	3.57	4.89	2.45	3.62
17	3.56	4.85	2.47	3.62
18	3.57	4.87	2.52	3.67
19	3.58	4.89	2.64	3.80
		FIR		
5	7.14	12.15	4.42	9.09
6	5.95	9.55	3.47	6.85
7	5.20	8.00	3.02	5.54
8	4.72	6.95	2.71	4.76
9	4.32	6.30	2.52	4.25
10	4.02	5.81	2.40	3.94
11	3.80	5.43	2.34	3.78
12	3.61	5.13	2.34	3.72
13	3.44	4.87	2.38	3.70
14	3.30	4.66	2.43	3.74
15	3.16	4.44	2.55	3.78
16	3.05	4.26	2.68	3.85
17	2.93	4.07	—	—
18	2.83	3.91	—	—
19	2.73	3.75	—	—

based on labor paid by the cord, and using hand tools. If power saws are to be used, total time requirements for trees up and including 10 inches d.b.h. should be reduced by 10 percent. Total time requirements for trees 11 inches d.b.h. and larger should be reduced by 20 percent.

It is apparent from the table that great savings in labor requirements could be made by cutting no tree less than 9 or 10 inches d.b.h. This is especially true if a peeled-wood operation is planned, because peeling is the most time-consuming of all production jobs in the smaller diameters.

ARTHUR C. HART,
Research Forester,
Penobscot Research Center,
Northeastern Forest Experiment Station,
U. S. Forest Service.

Identification of Very Small Birch Seedlings

During a recent study of the reproduction of paper birch, one of the difficulties encountered was in identifying the very small seedlings. Many of these seedlings consist of just the two cotyledons and one miniature leaf. In this very small seedling stage, paper birch, gray birch, yellow birch, and even *Rubus* species (blackberry and raspberry) are very similar in appearance.

It was found that with the aid of a land lens and a simple taste test, proper identification is possible. Small paper birch seedlings are distinctly pubescent on the upper part of the stem, but gray birch seedlings have smooth stems (Fig. 1). Yellow birch seedlings also have this pubescense, but if the seedling is chewed, a slight but definite wintergreen flavor is apparent; paper birch seedlings do not have this flavor. The small *Rubus* seedlings almost invariably have a multiple stem arising from the roots instead of a single stem, and the scattered, minute spines on the stems are readily discernible with a hand lens.

Fig. 1—Upper-stem differences among small birch and *Rubus* seedlings (x10).

The two species most difficult to identify in this small seedling stage are paper birch and yellow birch. In some cases it is unnecessary to differentiate between these two species, since both are valuable crop trees.

This identification scheme would be further complicated in areas within the range of black birch, since both black birch and yellow birch have a wintergreen taste. Some means of differentiating between these two species would have to be developed if accurate identification were desired.

So far no attempt has been made to develop a system for field identification of seedlings in the cotyledon stage, in which no leaves are present.

RUSSELL J. HUTNIK,
Northern Hardwoods Research Center,
Northeastern Forest Experiment Station,
U. S. Forest Service,
Laconia N. H.

Heavy Mortality Does Not Always Follow Partial Cutting of Hemlock Hardwood Stands

The partial cutting of hemlock-hardwood stands in the Lake States has usually resulted in moderately heavy post-logging mortality. Heavy losses of hemlock, and often yellow birch, have occurred so frequently that foresters have come to accept it as an unavoidable result of partial cutting in any stand containing a large percentage of hemlock.

Severe mortality also occurs in uncut hemlock-hardwood stands. In 1939 Heritage[1] reported a very heavy loss of hemlock during the preceding five years on the Menominee Indian Reservation in northern Wisconsin. Secrest, MacAloney, and Lorenz[2] reported further on this loss at which time they concluded the heavy losses were primarily the result of a severe and prolonged drouth from 1930-37. Graham's[3] observations and studies on the Ottawa National Forest in Michigan agreed with this conclusion.

Mortality after partial cutting generally has been attributed to increased exposure of the residual trees after stands are opened up by cutting. Graham states in his report of research on hemlock mortality in Upper Michigan, "General observations indicated that the more severe the opening, the more likely the residual hemlocks were to die." Partial cuttings in hemlock-hardwood stands on the Upper Peninsula Experimental Forest at Dukes, Mich., have usually resulted in a heavy loss of hemlock, which was considered the inevitable result of opening up the stand.

In contrast to the frequent reports of heavy losses, a recent study of a hemlock-hardwood stand in

[1]Heritage, W. Forestry accomplishments in the Indian Service in the Lake States. Jour. Forestry 37: 717-718. 1939.

[2]Secrest, H. C., H. J. MacAloney, and R. C. Lorenz. Causes of the decadence of hemlock at the Menominee Indiana Reservation, Wisconsin. Jour. Forestry 39: 3-12. 1941.

[3]Graham, S. A. Causes of hemlock mortality in northern Michigan. Univ. Mich. School of Forestry and Cons., Bul. 10. 1943.

TABLE 1.—AVERAGE ANNUAL MORTALITY OF TREES STUDIED

Species	Trees included in sample[1]		Average annual mortality over 7 years		
	Sample trees	Volume[2]	Trees dying	Volume[2]	Proportion of sample volume
	Number	*Board feet*	*Number*	*Board feet*	*Percent*
Hemlock	95	6,834	1.14	105	1.54
Yellow birch	53	4,075	.14	7	.17
Other species	50	3,282	.43	14	.43
All species	198	14,191	1.71	126	.89

[1]The 198 study trees had a net volume equivalent to approximately 3 acres of the residual stand.

[2]Gross board feet Scribner Dec. C. Divide by 3 to arrive at an approximate per-acre figure.

Upper Michigan indicates severe mortality does not always occur after cutting. The stand of hemlock-hardwood selected for the study was logged in 1944, removing nearly 70 percent of the 10.8 M b.m. (Scribner) net per acre, leaving residual volume of 3.4 M b.m. net per acre. Most residual trees were less than 20 inches in diameter and of fairly good quality.

A total of 198 study trees selected at random along a 40-chain compass line and inspected annually have suffered only a moderate rate of mortality over the 7-year period since cutting. From all appearances, they are now well past any serious loss through post-logging mortality. Only 5 of the 198 trees have died as a direct result of exposure and shock. Seven other trees were lost by being broken over or uprooted by wind which might have occurred without cutting. Nevertheless, all 12 trees were considered in the mortality losses.

Annual mortality from all causes has averaged 42 board feet per acre or .89 percent of the 1944 residual volume (Table 1). Gross annual growth after deducting mortality has averaged 159 board feet per acre, about 4 times greater than mortality. Approximately 35 board feet of hemlock, 2 board feet of yellow birch, and 5 board feet of other species were lost annually per acre over the 7-year period.

Hemlock, as expected, proved to be the species most susceptible to post-logging mortality, but yellow birch readily withstood the shock of heavy cutting. The very heavy cutting which generally left the younger, thriftier, and less defective trees may have been the principal reason for the low rate of mortality. Possibly Lake Superior, less than 3 miles away, had some favorable effect. Mortality has obviously not occurred in sufficient volume to be considered a limiting factor in the partial cutting of this stand.

F. R. LONGWOOD,
Lake States Forest Experiment Station,
St. Paul, Minn.

An Analysis of Deterioration in Farm Structures[1]

The objective of this study was to develop a satisfactory plan for surveying deterioration in farm structures in order to disclose the causes of and conditions favoring deterioration, the parts of structures and types of material most subject to deterioration, and the volume of deteriorated wood.

Twenty-three structures on 15 farms were inspected during the development and trial of inspection forms. In selecting structures for Jour. of Forestry—16—Lawrence inspection, limitations of location, construction, age, and structure type were applied. The data sheets were designed to record general information on each farm and its owner, and general information and details of construction and deterioration on each structure inspected. An ice pick was the principal tool used in the inspection work.

All the farmers approached were cooperative and expressed interesting and helpful ideas concerning deterioration in structures and fence posts, and on wood preservatives.

Fungi and termites are found to be the principal causes of deterioration. The moisture necessary for the growth of these organisms was supplied by rain, animal waste, damp earth, high river water, splashed water, and leaking plumbing. Faulty or insufficient construction allowed penetration of rain through walls and roofs. Construction, storage, and natural factors hindered the drying of the wood by interfering with ventilation or blocking sunshine.

Deterioration was greatest in old and large structures, in structures that had moist interior conditions, in poorly ventilated structures, and in structures on farms that changed ownership frequently.

The sizes of farms, numbers of structures on farms, costs of structures, and the condition of paint on the outside walls showed no relationship to deterioration.

Deterioration in the foundation-sill-lower wall region was least in structures that had high concrete foundations. Deterioration in upper walls was least if siding and exterior joints were weather-tight.

Deterioration was greatest on the sides of structures exposed to the most severe weather and in portions of the structures closest to the ground.

The average volume of deteriorated wood was 70 board feet per structure.

Of the total volume of deterioration, 64½ percent could have been prevented by eliminating moisture sources, factors responsible for the penetration of rain, and factors that hindered the drying of wood, through good construction practices, maintenance, and sanitation.

DONALD D. BENSON,
School of Forestry,
Oregon State College,
Corvallis.

[1]Abstract of thesis presented for M.S. degree in forest products, Oregon State College, Corvallis, March 19, 1952.

An Unusual Type of Frost Injury in Pine

In the course of investigating certain twig abnormalities in young pine, believed due to nutritional disturbance, particular attention was given to identifying other injuries which might be related to, or confused with the one under study. Most disturbances were readily accounted for but the cause of a characteristic bending or severe crooking occurring in shoots of a previous year was unknown. This abnormality was widespread in Herkimer, Oneida, and Lewis counties, New York, on the great sandy glacial outwash terrace surrounding the Adirondack Mountains.

The severity of the distortion noted (Fig. 1) varied from a simple crook or offset, usually near the middle of a terminal shoot, to a pronounced S-shaped crook which, in many instances, was bent acutely and distorted in more than one plane. The injury was restricted to shoots formed in 1950, and affected all species of pine in the plantations: white, red, jack, Scotch, and ponderosa, (*Pinus strobus*, *P. resinosa*, *P. banksiana*, *P. sylvestris*, and *P. ponderosa*). For the most part the affected trees were 10 to 18 years old but only 3 to 8 feet in height.

Presence of the injury on five species in a single year suggested a climatic factor. Although spring frosts are common rather than unique on these level sandy soils, the possible role of frost was indicated by typical curled and dried young shoots at the 1949 node in some trees and occasional dead tips on 1950 leaders; in the latter instances no crooking occurred but a typical frost ring was found in the wood of the living stub.

Search of the literature disclosed two illustrated accounts of similar distortion and its origin: Hartig (*4*) and Rhoades (*6*), reported a "wilting" of young shoots immediately following sub-lethal frost injury to Scotch pine and Japanese red pine (*P. densiflora*), respectively. Later the wilted shoots regained turgor and turned upward,

FIG. 1.—Distortion following late spring frost. *Left* to *right*: Red pine, Scotch pine, white pine.

incorporating a permanent curl or crook as the tissues hardened. Internally the injury resulted in a typical frost ring which, near the base of the shoot, was well within the secondary wood; higher on the shoot this zone was in the youngest-formed wood and outermost cells of the pith, reflecting the various degrees of development at the time of injury. These descriptions agree wholly with observations on the present material, including the frost "ring" at successive heights on the shoot. This agreement, considered with the other evidence mentioned, indicates frost as the cause of the injury.

Such temperature records as are available from weather stations within the general area (*8*) reveal that freezing or near-freezing conditions occurred on June 12, 17, 18, and 22, 1950. Although the minimum temperature reported was 30 degrees F. local temperatures in the level open plantations may well have been lower. Hence the frost leading to injury described very probably occurred on one of the above dates, with June 18 the most likely choice. A date earlier than June 12 is improbable because of the advanced growth stage at which injury occurred, as demonstrated by the relative position of the crook within the shoot. Thus in the instance reported by Rhoades, low temperatures occurring near the end of March at Washington, D. C., following an unusually warm month, resulted in crooking very near the base of the new shoots.

Injury of this nature appears to be rather rare, demanding conditions of freezing intermediate between those of complete killing and those of no visible injury at a time when the shoots are well emerged. Rhoades observed it only once in his extensive studies and Sorauer (*7*) refers only to the example described by Hartig. Nothing of the sort is mentioned by Day and Peace (*2, 3*) in their comprehensive work on experimental production of frost injury. Although Belyea and MacAloney (*1*) make general reference to Hartig and others, their only description of crooking relates specifically to the upturning of lateral branches to replace dead terminal shoots. Nevertheless, such injury probably has been observed occasionally in the field without assignment to definite cause.

In the present instance the crooked shoots have generally maintained normal apical dominance. Where complete killing of the 1950 shoots occurred a new terminal has often regenerated from small latent buds at the 1949 node, particularly in red pine, corresponding to Kienholz's "single leader" type of recovery (*5*). Where the tip only of a 1950 shoot was killed new shoots usually regenerated from needle fascicle meristems near the end of the living portion.

E. L. STONE, JR.,
Department of Agronomy,
Cornell University,
Ithaca, N. Y.

Literature Cited

1. BELYEA, H. C. and H. J. MACALONEY. 1926. Weather injury to terminal buds of Scotch pine and other conifers. Jour. Forestry 24: 685-690.
2. DAY, W. R. and T. R. PEACE. 1934. The experimental production and diagnosis of frost injury on forest trees. Oxford Forestry Memoir 16.
3. ———. 1937. The influence of certain accessory factors on frost injury to forest trees. Forestry 10: 124-132; 11: 11-29, 92-103.
4. HARTIG, R. 1895. Doppelringe als Folge von Spätfrost. Forstl. natur. Zeit. 4: 1-8.
5. KIENHOLZ, R. 1933 Frost damage to red pine. Jour. Forestry 31: 392-399.

6. RHOADES, A. S. 1923. The formation and pathological anatomy of frost rings in conifers injured by frosts. U. S. Dept. Agric. Bul. 1131.
7. SORAUER, P. 1914-22. Manual of plant diseases. I. Non-parasitic diseases. 3d ed. Transl. by F. Dorrance. xvi + 908 pp. Record Press, Wilkes-Barre, Pa.
8. WEATHER BUREAU, U. S. DEPT. COMMERCE 1950. Climatological data; New York. 62(6).

New Forestry College on Cyprus Serves Middle East

In recent years the Arab countries have shown keen awareness of the need for forest conservation to improve the growth and prevent the waste of wooded areas in their arid lands. In the Middle East, more than in most other regions, a tree is a thing to be tended and cherished, but the scientific knowledge necessary to "make two grow where but one grew before" has, until recently, been difficult to acquire there by even the most earnest student of modern afforestation methods.

The need for some Middle East school of forest conservation has, in fact, become increasingly acute in the Arab States as their standard of general husbandry has risen. With the opening in September 1951 of the Cyprus Forestry College, however, the Middle East has been provided, virtually on its own doorstep, with a training center at which the latest theories and techniques employed in the conservation of forest land can be demonstrated by experts—a center catering especially for students from Arab countries.

Like many another measure aimed at the general betterment of living conditions for the Arab peoples, and at helping them to make the best use of their own resources, the Cyprus Forestry College owes its creation in its present form mainly to the efforts of the British Middle East Office.

The first proposal was to establish a school solely for the training of the staff of the Cyprus Forest Department. It was only through the far-sighted endeavors of the BMEO that the scope of the college was extended to include, and indeed to specialize in, the instruction of Arab forestry students.

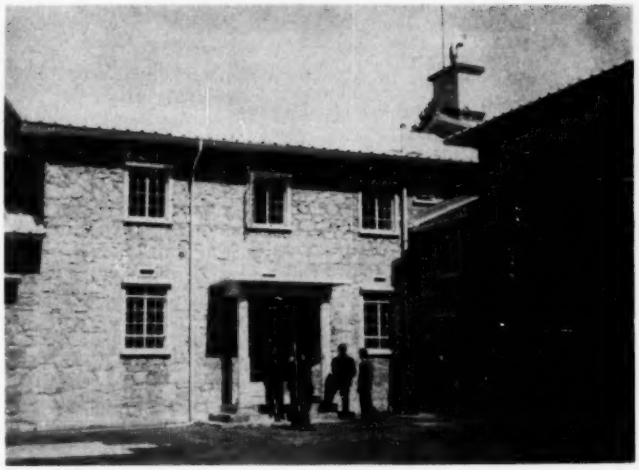


FIG. 1.—Students at the new Forestry College at Prodhomus, Cyprus, the forestry center of the Middle East.

Thus, of the 28 trainees attending the first course held at the College, 12 are from Arab countries—three from Jordan, four from Syria, two Iraqis, two Libyans, and an Egyptian. It is hoped that students from the Lebanon and Saudi Arabia will be enrolled at later sessions.

The maximum number of students attending any course at the College is scheduled at 36, and each "intake" will be divided into two classes of 18. By this means the benefits of concentrated and largerly divided instruction are assured.

The school building, which is in Prodhomus, cost £50,000 ($140,000) to install and equip, and is admirably suited for its purpose. The living accommodation—each student has his own bedroom—is luxurious, and central heading guards against the spasmodic rigors of the Cyprus winter.

The British Principal of the College is R. J. Streets, who worked in Cyprus during the war, and was later put in charge of the Forestry Commission's School in Thetford, England. During the course of his war service he conducted classes for members of the armed forces who were ambitious to take up forestry as a peacetime career.

The Cyprus Forestry College is the only establishment in the region of the Middle East devoted specifically to the training of students of the "ranger" and "forester" grades. Although Istanbul University includes the subject of forest conservation in its curriculum, it deals with it on a somewhat higher level than the general student can be expected to have reached without specialized study. The next nearest school devoted to instruction in the subject is in Pakistan.

In short, there can be no doubt that the Cyprus College will meet the great demand among Middle East forestry students, and it is hoped that, profiting from its example, individual Arab countries will set up their own forestry schools, on similar lines, within a few years.

The science of forest conservation is comparatively new to the Middle East, and its widespread application will have the effect of increasing the wealth and quality of the soil, reducing waste, and ensuring the full exploitation of timber. At the Cyprus College, Arab students will learn how to make forest land ever more productive.

WILLIAM BLUETT.

Points of View

Grazing Damage in Southwest

As one of the researchers who worked on the study of grazing damage to ponderosa pine reproduction on the Coconino Plateau of Arizona I also would like to offer some corrections for the record.

Under "Points of View" in the July, 1951, JOURNAL,[1] the U. S. Forest Service is credited with the statement that the reproduction literally outgrew the grazing damage. It is true that on certain plots rarely visited by steers and where the fat juicy tips of the vigorous young pines were sometimes eaten off with apparent relish that these damaged pines did catch up in growth with the uneaten pines. A more significant fact however is that within the radius of some 15 or 20 miles of Flagstaff, a city largely dependent on ponderosa pine logging and milling, a person may today find many sections of land that are poorly stocked with reproduction and much of this loss has been due to sheep and cattle grazing. Just look in the vicinity of the old permanent watering places and old sheep bedding grounds! Somewhere in his experience Mr. Pearson must have gotten the idea that a lot of small poorly stocked areas would in the aggregate add up to a great loss to a community dependent upon forest products. Anyway his great ambition was to work out ways and means of getting more pines to grow on the poorly stocked areas of the Southwest. These areas within the great pine belt with acres and acres of land crying for young trees so that they might be able to fulfill their role in God's creative world were to Pearson like empty cupboards in a kitchen.

The great trouble with the Forest Service is that it fails to face realities on the ground. The reality, for example, of some 640 acres of young pines that were burned up near the scene of the reproduction study after they had outgrown grazing damage; burned up because funds for a fire and road crew in high hazard areas was not available. With the growing up of reproduction into dense sapling stands, fire hazards have increased tremendously without a corresponding increase in protection forces. Even the loss of a 25-mile strip of young ponderosa pine growth on the north side of the Capitan Mountains on the Lincoln National Forest has not been sufficient to bring home the folly of a remote control brand of forestry. Nor has the fact that mesquite trees are a far greater asset to a semiarid region than the tallest and thickest grass could be ever been entered on their records. There are no semiarid areas on the face of the earth which do not need more trees instead of fewer trees if it is true that shelter belts have value and that forests do increase rainfall as they do in the area surrounding Copper Basin in the South and on certain experimental areas in Russia and France.

But the hardest reality of all for the Forest Service to face is the reality of their brushy watershed lands where the grazing problems can never be solved by the grazing permit reduction method but only by the purchase of ranch properties on these eroded lands, many of which will require the construction of artificial works such as were utilized on the Davis County Watershed in Utah. Other lands will require even more expensive measures of control.

The many abandoned ranger stations in the Southwest bear mute testimony to the fact that as the problems on the ground have multiplied the help in correcting the problems has dwindled away.

All the reports which can be complied will not help to restock the Southwestern ponderosa pine lands unless help is available to carry out the recommendations and plans.

BARNARD A. HENDRICKS,
Waco, Texas.

[1]Forest Service defends pine monograph. Jour. Forestry 49:526. 1951.

Forest Practice Based on Facts, Not Fancy

Ellery Foster's article, "Approved (?) Logging Technique" in the February 1952 issue of the JOURNAL, condemns patchwise clear-cutting in overmature Douglas-fir, and asks, "Do I hear any voices?" He will, but probably not the type he is wishing for.

Some 15 or 20 years ago, with the advent of the logging tractor and truck, it was exceedingly profitable to high grade Douglas-fir stands and take out the biggest and best Douglas-fir trees. For a time, the individual tree selection system became so popular that it was forced upon many who knew better. Also, depressed markets sometimes forced operators to cut the large firs and save the others, including the understory of tolerant species, for a later market. But every well-informed forester knew then (as now) that it was impossible to practice individual tree selection silviculture with an intolerant tree like Douglas-fir, that will not reproduce in the shade of the normal dense stands in which it grows.

In order to have a record of the effect of selection cutting in these old-growth stands, we immediately established permanent sample plots in advance of this type of cutting in all parts of the Douglas-fir region —a total of some 80 acres of individual sample plots in groups with all trees tagged. These plots were measured in advance of logging and after logging to record loss and damage, and at 3- to 5-year intervals since to measure growth and mortality. These records give positive evidence of the loss from windfall, insect attack, decay, and other mortality in widely scattered parts of the Douglas-fir region. Five- and 10-year records are now available, and 10-and 15-year records are in the process of being worked up. Some data were given in the chief forester's (U.S.) annual report for 1947, on page 37. More is as follows: Ten of 15 selectively cut areas showed an annual net loss at the

end of 5 years, the other 5 showed an annual net gain in volume. Six of the areas have been under observation for 10 years; 5 of these showed an annual net loss at the end of the first 5 years, and 3 of the 6 still showed an annual net loss at the end of 10 years. The average annual loss for these 6 areas during the 10-year period was great—1,500 board feet per acre per year over and above annual growth. With no further loss, these areas would have to grow 1,000 board feet an acre per year for the next 15 years to build back the volume they contained after the cutting operation was completed 10 years ago. These figures are based on gross volume and do not include accelerated decay losses that result from logging injury, and these losses are great. Douglas-firs in old-growth stands are mostly even aged and old—and this is a vital point. When a single tree or even a small group is removed it is not replaced by Douglas-fir but by brush and the more tolerant species of hemlock and true firs. These species produce a tree and stand that is inferior to Douglas-fir over most of the region, and when we hasten the transition to that type of climax forest we are not practicing good silviculture. Old stands are not rejuvinated by selection cutting, in fact, increment borings on the sample plots showed that only 10 percent of the Douglas-firs showed released growth after selection cutting. Also, there is always the danger of severe windfall loss when old forests are opened up. Among causes of mortality, it headed the list, insect attack was second.

A light partial or intermediate harvest cut not only has a place but is good business in young growth and in thrifty mature stands, provided there are enough Douglas-fir stems left after the cut to retain possession of the site and the stand remains windfirm. That will prolong the rotation, produce bigger trees and higher quality material. In fact, that is the only manner in which we can continue to grow Douglas-fir forests with large trees. But once that point of maturity is passed and the brush and tolerant species begin to take over as the Douglas-firs drop out, the stand must then be clearcut if you wish to reproduce a Douglas-fir forest. Most of our old-growth forests are already in that transition stage.

Foster suggests that we take out a large tree at a time "just as Nature does." Well, when Natures takes out a large old Douglas-fir, she replaces it with a scrubby hemlock, cedar, or true fir. But when she wants to reproduce a Douglas-fir forest, she wipes the slate clean by fire, insects, or disease, or a combination of these. And that is exactly what is being done by a patch-wise system of clearcutting in over-mature Douglas-fir stands.

Sentimental foresters who wish to criticize cutting practices will find it far safer to study the book of Nature a little more carefully before quoting from it, or safer to quote from a reliable silviculture book than to quote from Stephen Benet's "Ode to Walt Whitman."

LEO A. ISAAC,
Pacific Northwest Forest and Range Experiment Station, Portland, Ore.

Ellery Foster, in his letter published in the February 1952 issue of the JOURNAL states, "Surely, there are many who believe that practical foresters and woodsmen, if they put their heads, hands, and hearts to it, could devise feasible ways of logging lightly and frequently over the whole forest—thereby preserving the cake and eating it too, just as Nature does." I believe that this is referring to a selection system of logging which works fine in a climax forest type. But, a Douglas-fir forest type is not climax; rather it is a subclimax.

When Mr. Foster says, "Just as Nature does," it is my idea that he is referring to the process of old, over-mature trees dying and younger ones replacing them. The point overlooked here is that when a single tree in a Douglas-fir stand dies it is replaced, not by a young Douglas-fir, but rather by a more tolerant species as western red cedar, western hemlock, or white fir.

Douglas-fir, as a subclimax type, owes its very existence to catastrophic disturbances in the past which cleared areas in a manner similar to that shown on the photograph under discussion.

For further study on the subject, I would cite Leo A. Isaac's very excellent publication *Reproductive Habits of Douglas Fir* and make special reference to the section on "Partial Cutting Methods," which starts on page 100.

It is generally agreed among both industrial and public foresters that the technique of staggered settings is the best method of handling the Douglas-fir forest type; it is therefore rather peculiar that Mr. Foster, alone, desires to take issue with the method.

RUSSELL S. WALTERS,
Corvallis, Ore.

Ellery Foster's categorical condemnation of patch-wise clear-cutting in the virgin forests of the Pacific Northwest[1] represents a type of wishful thinking which must be answered by facts rather than condoned by fevered "voices." The evidence from both research and practice in that region should be enough to convince anyone that partial cutting in old-growth Douglas-fir represents one of the greatest fiascoes yet indulged in by American foresters. The convictions of this writer are based to a large extent on observations made several years ago during a routine remeasurement of sample plots established in the 1930's on selectively-logged areas in western Washington. It is apparent that most foresters in the Northwest have abandoned this line of approach as a general method but the ghost still stalks in the minds of many outside the region. The facts about the disappointing results of selection cutting in old-growth Douglas-fir have so far been presented in the literature only as opinions unsupported by data or as fleeting refer-

[1]Foster, Ellery. Approved (?) logging technique. Jour. Forester 50: 136. 1952.

ences in the annual report of the Pacific Northwest Forest and Range Experiment Station for 1946 and that of the Chief of the Forest Service for 1947. It would seem that posterity and the profession should have a comprehensive account of these results in order to lessen the possibility that similar mistakes will be made in the future and, more generally, in other old-growth stands of similar characteristics.

The majority of the virgin stands of the Pacific Northwest represent extreme examples of forests in which we cannot "have our cake and eat it too" through "selective cuttting." It is perhaps superfluous to point out that the most favored species, Douglas-fir itself, requires full sunlight for acceptable growth on most sites. Beyond this, it is high time that all foresters realize the futility of attempts to counteract the manifold natural agencies such as fungi, insects, and wind which cause these forests to start to open up after they have become 100 to 150 years old. Thereafter any partial cutting in the overstory appears to set off a chain-reaction which accelerates rather than halts the deterioration. When the surviving Douglas-firs in these stands have reached an age of several centuries the associated younger hemlocks and true firs have become too defective and decadent to be regarded as "growing stock" worthy of retention. Rather than bemoan our inability to prolong the lives of these ancient stands we should be thankful that an ecologically sound method of regeneration happens to coincide with a means of logging feasible from the standpoint of engineering.

Mr. Foster would have been on more defensible ground had he advocated increased attention to the problem of insuring that the old-growth is liquidated gradually in an orderly and efficient manner. Improved access to these forests is needed, not to permit widespread application of "selective" partial cutting, but to enable patch-wise clearcuttings to be carried out in the stands which need them worst rather than in those most readily logged at the moment.

The same pathetic unwillingness to cast loose from the giant trees of the old-growth forest and seek thrifty regeneration prevails in almost every part of the country. It is all to easy to cull out the trees of desirable species and form in the name of selection cutting and leave behind a defective residual stand which will neither grow nor admit desirable regeneration. Many of these stands are left with so few trees presently or potentially merchantable that rehabilitation is impossible except at prohibitive expense. Numerous examples of this sort of thing can be found in the old-growth forests of the East, to say nothing of other regions. It is fortunate that outstanding exceptions exist, as in the ponderosa pine and coast redwood types. Other exceptions could be named, but it should be noted that the application of selection cuttings to any old-growth stand represents a calculated risk which should not be undertaken blindly. Many stands of this kind are better stored on the stump until the timber is needed than tampered with in misguided attempts to convert them into productive units. It is easier to find thrifty young stands which have followed "destructive" clearcuttings of old-growth than it is to find old-growth stands rejuvenated by artistic application of the selection principle.

DAVID M. SMITH,
Yale School of Forestry.

Following are a few comments based upon opinions formed by the writer after five years forestry training at a college in the heart of the Douglas-fir region, and over five years working with the component species in the same region. These comments are prompted by Ellery Foster's remarks in the February JOURNAL.

Clearcutting certainly is a proper technique in stands of old growth Douglas-fir. Barring fires, the "greatest softwood forests," to which Ellery Foster refers could easily degenerate into a shaggy looking, wasteful, heterogeneous population of inferior individuals.

This could happen by 100 percent selection cutting or non-cutting of mature Douglas-fir stands. In order to produce vigorous stands of Douglas-fir the seed bed must be open so that an even age population may develop. Douglas-fir is intolerant.

Mature stands in the Douglas-fir region show no net growth, and few individuals in the stand, regardless of size, are putting on any appreciable increment. Therefore, it is better to take the nation's requirements of this species from a limited area rather than to crawl all over seven or eight times as much area to harvest trees which are no longer growing. Why pass up one tree that is not growing to cut another?

To qualify these statements we must recognize that stands of timber vary as to age, condition, and species. After Douglas-fir stands reach maturity their composition begins to change toward a climax type. Within the Douglas-fir region the climax type is a mixture of hemlock, cedar, and species of *Abies*. The extent to which a Douglas-fir stand has progressed (or retrogressed in many cases) toward the climax type determines its adaptability to selective logging. In other words, the closer the stand is to the climax type the less is old growth Douglas-fir a component. The understory stand, the climax type, then becomes progressively a more important factor in the logging plan. Depending on size, species, thriftiness, and adequate market the understory may be prelogged, logged with the fir overstory, re-logged, or left in a growing condition for future harvest. The latter decision calls for selective logging and topography that will permit such methods.

An old growth Douglas-fir may be 200 feet tall and weigh 25 tons. Sixteen foot logs (32 foot logs more standard and practical) will weigh ten tons or more. Such sizes and weights require heavy equipment. In dense West Coast stands such

sizes are important factors in any decision to do selective logging.

Several attempts (not all) at selective logging in old growth stands of the Douglas-fir region have resulted in potential loss, brought to man's use only through marginal salvage operations. Each salvage has left a stand less promising and at least as much subject to loss as it was before. Far better were all the trees harvested, and the area left (with protection from fire of course) to regenerate and grow a vigorous new stand.

There should be no doubt that most old growth stands in the Douglas-fir region should be clear cut. The major considerations should be markets for component species and sizes, economical access, adequate seed source, and protection after logging. No, clearcutting is not synonymous with destructive logging! In fact, waste in the form of decay and stagnant growth can be arrested by concentrating the cutting on the overmature stands firs allowing them to regenerate and again become a vigorous growing forest.

Mr. Foster spoke of a large log economy. The one good thing about large logs is that, in their unattended development, sufficient time (200-300 years or more) has allowed them to grow clear wood free of knots. Good forestry on second growth forests will result in more clear wood per acre in logs of 24 to 36 inches in diameter than did the parent stand. These could easily develop in 100 years under good management. It is in these second growth stands that sound management is needed to grow the quality timber we need. Here is where foresters will exert themselves to maintain and increase the wealth of the forest industry.

B. A. BRANDES,
Sandpoint, Idaho.

The Cost of A Scientific Journal—A Correction

I read with interest the article by Stephen Spurr[1] in the May JOURNAL OF FORESTRY. I am completely sympathetic with his reasons for promoting a scientific forestry journal, but I must protest his misrepresentation of the finances of *Ecological Monographs*. Not only does he give readers the wrong idea of the cost of such a journal, but he deprives Duke University of the credit for its substantial subsidy over the years.

The actual situation is as follows:

	Deficit	Profit
1945	$ 718	
1946	513	
1947	2,840	
1948	3,406	
1949	1,684	
1950		$1,485
1951	30	
	$9,191	$1,485

I do not know how Dr. Spurr arrived at his figures, but it is apparent that if he had looked over the record of the past seven years he would have found that Duke University has subsidized the journal to the extent of an average $1100 per year and that, additionally, the Duke Press handles the business end of the journal with no charge. This too is a substantial contribution, since it includes everything from bookkeeping and clerical work to storage of back numbers.

HENRY J. OOSTING,
Botanical Editor,
Ecological Monographs.

More About a Scientific Journal in Forestry

The point-of-view expressed in the May JOURNAL that we need a scientific journal in forestry has brought forth considerable response, all of it favorable. Here are excerpts from some of the letters received:

"I am sure the time has come when the JOURNAL OF FORESTRY can no longer succeed in being all things to all foresters. This seems to be an opportune time to launch the type of project you propose.... Along the lines of finances, I would like to suggest that, at some point, consideration should be given to alternative subscriptions to one of the two journals. This, as you know, is the practice of the A.A.A.S."

"Although I am not a research forester, my interest in all phases of forestry are such that I would welcome such a publication in addition to the JOURNAL OF FORESTRY (but not in competition with the same). I also believe that there are many others with the same views as mine. I, for one, am a potential subscriber."

"The May JOURNAL OF FORESTRY came in half an hour ago. May I express emphatic agreement. The question is not whether but how to obtain a scientific journal. . . . The proposed journal would both benefit from, and do credit to Society sponsorship. . . . Of course, no loyal forester would forego the present JOURNAL OF FORESTRY but it might be possible to deprive ourselves of one referendum a year, the cost thereof going to support the new journal."

There is one point that needs amplification. In my previous statement, I quoted figures for the financial support of *Ecological Monographs*, using the 1951 financial report of that journal. Dr. Henry J. Oosting, botanical editor of that journal, points out that 1951 was not a typical year financially (see his statement above).

Duke University certainly deserves credit for its contribution to *Ecological Monographs*. Dr. Oosting's point also serves to demonstrate the relatively small cost necessary to maintain a really good scientific journal. It should not be too difficult to find some university or other agency interested in forestry research willing to make comparable contributions to establish an maintain a first-class journal of forest science.

STEPHEN H. SPURR,
School of Forestry,
University of Minnesota.

[1]Spurr, Stephen H. We need a scientific journal in forestry. Jour. Forestry 50: 397. 1952.

Reviews

Gifts from the Forest.

By Gertrude Wallace Wall. 96 pp. Illus. Charles Scribner's Sons, New York 17, N.Y. 1952. $2.50.

In *Gifts from the Forest* Mrs. Gertrude Wall, her photographer son-in-law John Towsley, and Scribner's, have created for the young reader a vivid book about lumbering in California. Mrs. Wall's writing is aimed at the elementary grade level, as is Scribner's format. Mr. Towsley's photographs appeal to any age. He shows rare skill in portraying the men and equipment which make the lumber industry a dramatic one. As the author states in her prefatory acknowledgement, "Photography is the essence of this book."

Mrs. Wall, formerly an elementary-school teacher, has checked her text with professional foresters and lumbermen. As long as she devotes her talents to factual descriptions of felling, road-building, log-loading, or sawmill operations, she does well enough. However, the first portion of her book, in particular, is marred by the stamp of "precious" writing, which, in this reviewer's opinion at least, has no proper niche in the literature of forestry, lumbering, or general conservation, whether aimed at young fry or adults. One can only ignore such picture captions as "Here is the friendly forest before man has begun to cut trees for his use" or statements like "Although we all love the grace and beauty of a big tree and hate to see it cut, we must also remember that we need wood in many articles that we use daily." Compare this with the plain-spoken exposition of *Forestry and Lumbering* (Longmans, Green, 1939) by Josephine Perry and Celeste Slauson, and it is easy to understand why teachers and children's librarians bemoan its passing out-of-print. There is present need in the juvenile literature field for books about our forest industries. *Gifts from the Forest* is no replacement for *Forestry and Lumbering*, though it is only fair to state that Mrs. Wall probably did not intend it to be one. If her objective was to tell a story of lumbering, interwoven with admonitions about conservation, she has, on the whole, done a good job.

We adults can pronounce our pompous judgements in print, but the young reader is the final arbiter of the merits of books like *Gifts from the Forests*. My copy has been submitted to the scrutiny of one six-year-old (chief interests, Hopalong Cassidy and Tom Corbett, Space Cadet), who proclaims the pictures to be "super." Many people of greater age and other interests will agree with him.

FRANCES J. FLICK,
U. S. Department of Agriculture Library.

American Universities and Colleges.

Compiled by Mary Irwin. 1105 pp. American Council on Education, Washington, D. C. 1952. $10.

The sixth edition of this useful reference work contains descriptions of 904 colleges and universities.

One of the interesting chapters has to do with professional education, and presents a brief history of 19 recognized professions together with a list of schools satisfying their current professional standards. Forestry is one of the professions written up, and the 25 institutions accredited for forestry instruction are listed.

This is a reference work of the greatest value to any individual or organization concerned with higher education. Its wealth of information is enormous.

For example, few foresters, except those on university staffs, may realize that there is a standard academic costume code, and that the color of the trimming on the doctor's black gown is russet for forestry.

According to this book, four schools of forestry will observe fiftieth anniversaries next year. They are those at the Universities of Maine, Michigan, and Minnesota, and Michigan State College.

HENRY CLEPPER

Forest Inventory.

By Stephen H. Spurr. 476 pp. Illus. The Ronald Press Company, New York, N. Y. 1952. $8.50.

This publication is a comprehensive report on present-day forest mensurational techniques. It deals with the measurement of trees and stands, the estimation of their volume, the prediction of growth, and sampling problems involved in forest inventory design.

The organization of the book is somewhat comparable to the usual mensurational approach but has a much wider scope.

Parts I covers forest measurement, where the basic tree measurement techniques are reviewed. The use of aerial photographs in measuring trees and stands is covered in a thought-provoking manner. Also included is a chapter on the various types of sample plots.

Part II deals with the broad and intricate problem of volume estimation. A wealth of information is incorporated in this section regarding all the aspects of tree and stand volume. Included is a survey of the various methods used in volume table construction, along with a critical investigation of existing and new volume table construction techniques. An evaluation of the Girard form-class concept is made; followed by this statement, "Except for research purposes, where the form class of each tree is carefully determined, the use of the

form class tables cannot be recommended." Agencies using the ocular or average method of form class determination may question this statement.

Part III covers growth estimation, and included is a good discussion of the basic concepts of forest growth. The continuous inventory and the stand table projection methods of estimating growth are described. A description of American and European yield table methods is included.

The chapters on density and site are very good. The increased importance of soil in evaluating the productive capacity of forested areas is stressed.

A chapter is devoted to an explanation of the two-way method of predicting growth. Primarily, this means that volume growth should be estimated by a two-way approach; one leading to the estimate of height growth and the other leading to the estimation of basal area growth. The reason for using this procedure is that growth in basal area is rather poorly correlated with growth in height.

Part IV consists of a good discussion of sampling and inventory design. The chapters included in this part are confined to a brief summary of present-day sampling techniques, a review of the more important literature dealing with sampling problems in forest inventory, a discussion of representative forest surveys, and a presentation of the results of some experimental surveys, based upon ground and aerial photo measurements, which were carried on at Harvard Forest in 1948. Systematic sampling (mechanically spaced plots or strips) is still considered to be a sound procedure in forest inventory, provided that the general rules for estimating by sample areas are considered.

This book contains a vast amount of information which will be of interest to many foresters. As far as its use as a text is concerned, it appears that its greatest use will be at the graduate level. A sound knowledge of statistics is of utmost importance to understand fully various chapters of the book.

The bibliography of over 700 references represents the first compilation of original material in forest mensuration. The numerous references cited throughout the book make access to a forestry library highly desirable, and in many cases a necessity, to enable one to gain a more complete understanding of the material included in certain parts of *Forest Inventory*. This is not adverse criticism; it is to be expected in a work of this kind which covers such a wide and controversial field.

Aerial photography and photographic interpretation techniques are used whenever it is advantageous to do so. A well-grounded knowledge of the use of these forestry tools is essential to comprehend many of the procedures.

GEORGE STENZEL,
College of Forestry,
University of Washington.

❦ ❦ ❦

Jareb.

By Miriam Powell. 241 pp. Illus. Thomas Y. Crowell Company, New York, N. Y. 1952. $2.50.

To weave a theme of forest conservation into a novel for youth is no small task, but this is what the author of *Jareb* has done with fair success. The story is primarily of a boy and his dog, but the author fits their experiences into the awakening of a community to the need for and advantages to be gained from good forest practices. There is of course romance for interest and this is furnished in part through the usual medium of a girl, but trees and more particularly a group of loblolly pines and an ancient cypress play an important role.

The author lays the scene of her story in the flat lands of south Georgia. As to her intimate knowledge of that region, one cannot be sure, but her descriptions of the "rustling" palmettos, the "talking" pines, the live oaks, and the fluted cypresses are reasonably effective. The inclusion of tamarack among the trees of the region may be accepted as a mere slip of the pen.

A lazier and more worthless hound dog, one never saw than Sawbuck. His faithfulness to his master, however, and Jeb's love for him will appeal to any boy or girl who has ever owned a dog. The story opens with the two about to be forcibly separated through the trading ingenuity of Jeb's older brother. A new plow stock is needed for Paw to plow his fields, and in spite of Sawbuck's worthlessness, he is about the only thing left to trade. The consummation of this trade and the eventual return of the dog is one of the amusing incidents in the story. Jeb of course suffers tremendously but he is amply repaid by the acquiring of a new friend, a girl named Dovey.

A mysterious character in the story is Uncle Thirsty Andrews, a slightly crazy old Confederate veteran. He seems to have a knack for smelling smoke and is always on hand whenever there is a fire. Some say he sets them, but others, including Paw defend the old man strongly and call him "the best fire spotter in these parts."

Jeb has grown up hating the turpentiners who destroy the trees he loves. When his brother Gabe joins a new turpentining outfit that has moved into the community, he is much disturbed, but his heart is almost broken when he learns that Paw, who has always loved the trees too, has sold out to the turpentiners. As a result, he almost fails to give his father the pine seedlings, which have been earned by a lot of hard work in doing a good job of planting for a neighbor. Paw finally shows him that trees should be grown like any other crop and should be harvested and used "for the very work the Lord intended 'em for."

Thus a theme of better practices in farm forestry is woven into the heart of a good story for boys and girls.

G. NORMAN BISHOP,
University of Georgia.

Current Literature

Compiled by MARTHA MEELIG, *Librarian, The New York State College of Forestry*

Range Management Section Compiled by FRANCES FLICK, *Library, U. S. Department of Agriculture*

General

Chalked Shoes. By. B. K. Bird. Illus. Prospect Books, Prospect, N. Y. July, 1952; ltd. ed. $3.

Forest Biology. 20 pp. Illus. Science Service Canada Dept. of Agric., Science Serv. Bldg., Ottawa.

Forest Products Laboratory System for Classifying and Filing Research Project Records, rev. July, 1951. 69 pp. U. S. Forest Products Laboratory, Madison, Wis. DO-112.

Gold Coast Timbers. 39 pp. Gold Coast Forestry Dept, West Africa 1949. 1s. 6d. (Gov. Print. Dept., Takoradi Branch)

The Goodman Forest. 27 pp. Goodman Lumber Co., Goodman, Wis. 1952.

Smokey Bear's Story of the Forest. 15 pp. Illus. The State Foresters in cooperation with the U. S. Forest Serv. Washington 25, D. C. 1951.

The Story of West Coast Lumber. 16 pp. Illus. West Coast Lumbermen's Assoc. Portland 5, Ore. 1952. Free.

Trees of the Western Pacific Region. By J. H. Kraemer. 436 pp. Illus. Tri-State Offset Co., 817 Main St., Cincinnati 2, Ohio. 1951. $5.50.

Forest Management

Shortcuts for Cruises and Scalers. By L. R. Grosenbaugh. 24 pp. Southern Forest Expt. Sta., New Orleans, La. Occasional Paper No. 126. 1952.

Forest Products

Marketing Sawdust and Chipped Wood. 24 pp. Northeastern Wood Utilization Council, Inc. P. O. Box 1577, New Haven 6, Conn. Bul. No. 38. 1952. 50 cents.

Logging and Milling

Ohio Sawmill Directory Including Timber Buyers and Other Primary Wood Using Industries. By R. L. Sarles and J. F. Clovis. 92 pp. Ohio Agric. Expt. Sta., Wooster, Ohio. For. Cir. No. 1. 1952.

Pathology

Oak Wilt Recognition and Collection of Specimens. By T. W. Bretz. Folder. Illus. in color. National Oak Wilt Research Committee, P. O. Box 373, Memphis, Tenn.

Oak Wilt Threatens Nation's Forests! Folder. Illus in color. National Oak Wilt Research Committee, P. O. No. 373, Memphis, Tenn.

Permeability of Southern Pine as Affected by Mold and Other Fungus Infection. By R. M. Lindgren. 11 pp. Illus. American Wood Preservers Assoc. Washington 6, D. C. 1952.

What You Should Know About Oak Wilt. Folder. National Oak Wilt Research Committee, P. O. Box 373, Memphis Tenn.

Protection

Elm Leaf Beetle. 4 pp. Illus. State Univ. of New York College of Forestry, Syracuse. 1952. Free.

Studies of the Balsam Woolly Aphid, Adelges Piceae (*Ratz.*) *and Its Effects on Balsam Fir,* Abies Balsamea (*L.*) *Mill.* By R. E. Balch. 76 pp. Illus. Canada Dept. of Agric., Ottawa. Publ. No. 876. 1952.

White-Pine Weevil. 4 pp. Illus. State Univ. of New York College of Forestry, Syracuse. 1952. Free.

Range Management

Bluebunch Wheatgrass. By F. A. Smith. 5 pp. Univ. of Wyoming, Laramie. Wyo. Range Mgt. No. 45. March 1952. Mimeog.

Chemical Composition of Wyoming Forage Plants. By O. A. Beath and J. W. Hamilton. 40 pp. Illus. Wyo. Agric. Expt. Sta., Laramie. Bul. No. 311. February 1952.

Forage Habits of Mule Deer During the Late Fall, as Measured by Stomach Content Analyses. By O. Julander. 5 pp. U. S. Forest Serv., Intermountain Forest & Range Expt. Sta., Ogden, Utah. Research Note No. 2. March 1952. Mimeog.

Will 2, 4-D Control Sierra Larkspur? By A. B. Evanko. 6 pp. Illus. U. S. Forest Serv., Northern Rocky Mtn. Forest & Range Expt. Sta., Missoula, Mont. Research Note No. 109. April 1952.

Silviculture

Loblolly Pine Seed Source and Hybrid Tests in Southern Illinois. By L. S. Mineckler. 8 pp. Central States Forest Expt. Sta., Columbus 15, Ohio. Tech. Paper No. 128. 1952.

Nutrition of the Pine. By. T. N. Stoate. 45 pp. Illus. Forestry and Timber Bureau, Canberra, Aust. Bul. No. 30. 1950.

Planting and Growing Cottonwood on Bottomlands. By L. C. Maisenhelder. 23 pp. Illus. Mississippi State College Agric. Expt. Sta., State College. Bul. No. 485. 1951.

Soils

Exploratory Study of the Principal Soil Groups of Alaska. By. C. E. Kellogg and I. J. Nygard. 138 pp. U. S. Dept. of Agric., Washington 25, D. C. 1951. Agric. Monog. No. 7.

Tree Farms

Tree Farms—An American Approach to Forest Management. By W. D. Hagenstein. 15 pp. Univ. of British Columbia Faculty of Forestry, Vancouver. The H. R. MacMillan Lectureship in Forestry, 1952 (1).

Wood Preservation

Practical Directions for the Prophylactic Treatment of Timber, Bamboos and Plywood for Protection Against Insect Damage. By M. L. Roonwal. 3 pp. Forest Research Inst., Dehra Dun, India. Indian Forest Leaflet No. 125. 1951. (Ent.) As. /6/-or 7d.

Service Life of Treated and Untreated Fence Posts. 1951 Progress Report . . . By R. D. Graham. 28 pp. Oregon Forest Products Laboratory, Corvallis. Progress Report No. 5. 1951.

Wood Preservation During the Last 50 Years. By H. Broese van Groenou, H. W. L. Rischen and J. vom den Berge. 318 pp. Illus., tables. A. W. Sijthoff's Uitgeversmaatcappij N. V., Leiden, Holland. 1951. Fl. 24.

Wood Technology and Utilization

Diffusion in Wood; I. Diffusion of Ions Through Some Indian Timbers. By D. Narayanamurti, V. Ranganathan, and R. S. Ratra. 13 pp. Manager of publications, Delhi, India. Nineteen hundred fifty one. Indian Forest Bul. No. 151 (new ser.) Composite Wood. Reprinted from Indian Forester 77: 9: 1951. As./9/- or 10d.

Distribution of Tension Wood and Its Relation to Longitudial Shringage in Aspen. By B. Z. Terrell. 6 pp. Illus. U. S. Forest Products Laboartory, Madison, Wis. R1917. 1952.

Eucalyptus Serves Many Purposes. By Woodbridge Metcalf. 19 pp. Illus. Agric. Ext. Serv., Univ. of California, Berkeley. 1950.

Possibilities for the Production of Wood Briquette Stoker Fuel in Northern Michigan. By Hereford Garland. 22 pp. Forest Products Research Div., Michigan College of Mining & Tech., Houghton. 1950. Mimeog.

Society Affairs

Officers and Members of the Council, 1952-1953

GEORGE L. DRAKE, *President*
Simpson Logging Company
Shelton, Wash.

WILLIAM J. BROWN
Woodlands Department
Kimberly-Clark Corporation
Neenah, Wis.

D. B. DEMERITT
Dead River Company
6 State Street
Bangor, Me.

FRANK H. KAUFERT
School of Forestry
University of Minnesota
St. Paul 1, Minn.

ELWOOD L. DEMMON, *Vice President*
Southeastern Forest Experiment Station, Federal Building
Asheville, N. C.

C. OTTO LINDH
U. S. Forest Service
P. O. Box 1310
Albuquerque, N. M.

GORDON D. MARCKWORTH
College of Forestry
University of Washington
Seattle 5, Wash.

RICHARD E. MCARDLE
Forest Service
U. S. Department of Agriculture
Washington 25, D. C.

HENRY CLEPPER, *Executive Secretary*
Mills Building, 17th Street at Pennsylvania Avenue, N. W.
Washington 6, D. C.

EARL PORTER
Southern Kraft Division
International Paper Company
Mobile 9, Ala.

PERRY A. THOMPSON
12 Elkin Court
San Rafael, Calif.

RUTHFORD H. WESTVELD
Department of Forestry
University of Missouri
Columbia, Mo.

Joint Meeting of Canadian Institute of Forestry and Society of American Foresters

More than 1000 foresters are expected to attend the joint meeting of the Society of American Foresters and the Canadian Institute of Forestry to be held in Montreal, Quebec, during November 17-20 1952. The headquarters hotel will be the Mount Royal.

Hotel Reservations

In requesting hotel reservations, members should state that they are attending the joint meeting of the Canadian Institute of Forestry and the Society of American Foresters.

Reservations are often not held after 6 p.m., hence guests who expect to arrive after that hour should obtain confirmation from the hotel that rooms will be available. Usually, the number of rooms at the minimum rate, especially single rooms, is limited, hence hotels may confirm reservations at the next highest rate, if no room is available at the rate requested. Since rooms with twin beds will be easier to obtain than single rooms, members are urged to team up when possible. Moreover, the rate per person may be less. Early reservations are advised.

Remember that the first general session opens on the morning of November 18. The first technical session —forestry education—will be held on November 17; this will be the only open meeting on November 17.

Mount Royal Hotel

The headquarters hotel for the meeting is the Mount Royal, 1455 Peel Street. This hotel contains 1100 rooms and adequate accommodations are assured for all those who wish to attend. Daily rates are as follows:

Single room with bath: $6, $6.50, $7.50, $8.50, and $9.50.

Double-bed room with bath for two: $9, $9.50, $10.50, $11.50, and $12.50.

Twin-bed room with bath for two: $9.50, $10.50, $11.50, $12.50, and $14.50.

Three person in two rooms with bath: $15, $16, $19, and $21.

Three persons in one room with bath: $13.50, $14.50, and $15.50.

Suites for two persons: $21, $22, $24, and $28.

Other Hotels

Affiliated with the Mount Royal is the Laurentian Hotel, located at Dorchester and Windsor Streets, on Dominion Square. The Laurentian is five blocks from the Mount Royal, within easy walking distance. It is a large modern hotel (1,000 rooms). The rates are $5 up for single room with bath; $8.50 up for double room with bath.

Other good hotels in Montreal, all within a ten-minute walking distance of the Mount Royal, are the following:

The Windsor Hotel (700 rooms), Windsor and Dorchester Streets, is four blocks from the Mount Royal. Its rates are $6 up for single room with bath; $9 up for double.

The Queen's Hotel (500 rooms), Windsor and St. James Streets, is six blocks from the Mount Royal. The rates are $4 up for single room with bath; $7 up for double.

Hotel Berkeley (100 rooms), 1188 Sherbroke Street West; four blocks from the Mount Royal. The rates are $4.50 up for single room with bath; $8 up double.

Hotel de La Salle (175 rooms), 1240 Drummond Street; five blocks from the Mount Royal. Rates are $5 up for single room with bath; $8 up double.

Montreal has other hotels and numerous tourist lodges. Lists of these may be obtained from the Montreal Tourist and Convention Bureau, 923 Dominion Square Building, 1010 St. Catherine Street West.

Meeting Committees

W. A. E. Pepler is general chairman of the meeting. His address is Canadian Pulp and Paper Association, 2280 Sun Life Building, Montreal 2, P. Q.

Assisting Mr. Pepler as vice chairman, representing the S.A.F., is Henry Clepper, executive secretary.

The chairman of the Program Committee, which is arranging the programs for the general sessions and

the joint dinner of the two societies, is J. L. Van Camp, Canadian Forestry Association, 4795 St. Catherine Street West, Montreal 6, P. Q., Canada.

Assisting as vice chairman, and S.A.F. representative on the Program Committee, is Hardy L. Shirley, College of Forestry, State University of New York, Syracuse 10, N. Y.

General Sessions

The theme of this historical meeting is "Trends in North American Forestry." Two general sessions and seven technical sessions are being arranged.

Presiding as chairman of the first general session on November 18 will be D. A. Macdonald, director of the Forestry Branch of the Canadian Department of Resources and Development, Ottawa. This session will be opened with an address of welcome by K. G. Fensom of Vancouver, B. C., president of the C.I.F. The response will be made by George L. Drake of Shelton, Wash., president of the S.A.F.

Mr. Pepler will preside at the second general session on November 20. George A. Garratt of the Yale School of Forestry, New Haven, Conn. will close the meeting with a summation of the papers and the discussion.

Business Sessions

Executive meetings of the S.A.F. Council will be held on the morning and afternoon of November 17.

The C.I.F. Board of Directors will also hold a business meeting on November 17.

These meetings will be followed by a joint dinner of the S.A.F. Council and the C.I.F. Board of Directors during that evening.

The regular Society Affairs session of the S.A.F. will be held on the afternoon of November 18, and the annual business meeting of the C.I.F. will be held at the same time.

Technical Sessions

The C.I.F. does not have subject Divisions in its organization, as does the S.A.F. Instead, by mutual agreement of the officers of the two organizations, seven technical sessions will be scheduled. These seven technical sessions will cover the same general fields as the S.A.F.'s eleven subject Divisions. There will be no Division meetings at Montreal.

For each technical session a two-man committee has been appointed, one representing the S.A.F., the other the C.I.F. These committees will provide the programs for their sessions. Because of time limitations, it has been necessary to schedule some technical sessions for a half-day only.

Forestry Education

Technical sessions on forestry education will be held on the morning and afternoon of November 17.

The program chairman is Robert P. Holdsworth, Department of Forestry, University of Massachusetts, Amherst, Mass.

The co-chairman is J. W. B. Sisam, Faculty of Forestry, University of Toronto, Toronto, Ont., Canada.

Forest Management

Technical sessions on forest management will be held on the morning and afternoon of November 19.

The program chairman is Gordon Godwin, Ontario Paper Company, Thorold, Ont., Canada.

The co-chairman is E. B. Moore, Department of Conservation and Development, State House Annex, Trenton, N. J.

Silviculture

Technical sessions on silviculture will be held on the morning and afternoon of November 19.

The program chairman is Harold J. Lutz, School of Forestry, Yale University, 205 Prospect Street, New Haven 11, Conn.

The co-chairman is George S. Allen, Faculty of Forestry, University of British Columbia, Vancouver, B. C., Canada.

Forest Economics and Taxation

A technical session on forest economics and taxation will be held on the morning of November 19.

The program chairman is Ralph Marquis, Northeastern Forest Experiment Station, 102 Motors Avenue, Upper Darby, Pa.

The co-chairman is J. Miles Gibson, Department of Forestry, University of New Brunswick, Fredericton, N. B., Canada.

Wood Utilization

A technical session on wood utilization will be held on the morning of November 20.

The program chairman is J. H. Jenkins, Forest Products Laboratory, Isabella Street, Ottawa, Ont., Canada.

The co-chairman is R. C. Fraunberger, Southeastern Industries, Inc., Tioga and C Streets, Philadelphia 34, Pa.

Recreation, Wildlife, and Range Management

A technical session on forest recreation, wildlife management, and range management will be held on the morning of November 20.

The program chairman is Edward P. Cliff, Forest Service, U. S. Department of Agriculture, Washington 25, D. C.

The co-chairman is C. H. D. Clark, Royal Ontario Museum of Zoology, 100 Queens Park, Toronto 5, Ont., Canada.

Public Relations

A technical session on public relations in forestry will be held on the morning of November 20.

The program chairman is Ralph Unger, College of Forestry, State University of New York, Syracuse 10, N. Y.

The co-chairman is M. R. Wilson, Canadian International Paper Company, Sun Life Building, Montreal 2, P. Q., Canada.

Social Activities

Plans are being made for a luncheon of the two societies on November 18. It will be an informal affair designed to get those in attendance better acquainted with their colleagues from both sides of the border.

A reception and banquet will be held on the evening of November 19. In addition to an address by Dr. A. W. Trueman, president of the University of New Brunswick, one of Canada's outstanding educators and public speakers, there will be special awards made for outstanding achievement in forestry. President George L. Drake will present two awards in behalf of the S.A.F.—the Sir William Schlich Memorial Medal and the Gifford Pinchot Medal. These are to be surprise presentations; the recipients will not be announced until the night of the banquet.

As is customary at S.A.F. meetings, an evening (November 18) has been set aside for dinners and meetings of the forestry school alumni groups and other informal get-togethers. On this evening there will also be a showing of forestry motion pictures.

A committee is at work planning activities for visiting ladies. Among other events there will probably be a ladies' luncheon and a special tour of interesting and historical places in Montreal.

Side Trips

A special committee is preparing information about points of interest along main travel routes to Montreal so that members may make premeeting or postmeeting side trips. Later announcements will give the specific location of mills, forestry operations, and laboratories, with instructions as to when and how to get to them.

Progress Report of Special Committee Division of Public Relations

At the October 1949 annual meeting of the Society of American Foresters, held in Seattle, Wash., the following resolution was passed by the Division of Public Relations:

That a committee of the Public Relations Division of the Society of American Foresters be appointed whose duties will be to make a study of the following phases of public relations and report its findings to the Public Relations Division, together with an action program to be submitted to the Society of American Foresters:

1. Educating the public relative to forestry—the situation, problems, and solutions. How to get facts to the public in language that the layman can understand. How to reach common agreement among federal, state, and private foresters as to basic facts to be presented to the public.

2. Keeping key individuals and groups such as newspapermen, free lance writers, and conservation groups correctly informed as to these basic facts and common objectives on which foresters are united in desiring action.

3. Inculcating in Society members a better understanding and appreciation of the value of the use of basic public relations principles, techniques, and methods in educating the public, and in getting public appreciation of the importance of forestry locally, nationally, and internationally.

The committee appointed herewith submits the following report:

The committee makes the following basic assumptions which are presumed to have the endorsement of Society members:

1. All foresters as individuals are at one time or another public relations representatives of their profession, and should be proficient in knowing the fundamental techniques of simple public relations particularly usable on a community and regional level.

2. There is and will continue to be a need for the services of professional public relations specialists to help develop public interest, understanding, and support of forestry in America, but the greatest need is for all foresters to become more public relations conscious in their home environment.

3. The national, sectional, and chapter meetings of the Society provide the best common meeting ground where public, private, and other foresters can exchange ideas on technical, semi-technical, and popular phases of forestry. These meetings can help unify the "common front" approach for gaining greater public acceptance of forestry.

4. Advantage should be taken of these meetings to (*a*) stress in planned programs the public relations aspect of forestry as well as the technical aspects; (*b*) discuss fully the local and national forestry situation, problems, and solutions; (*c*) reach agreement to the extent possible on basic facts; (*d*) study the techniques of and otherwise prepare the membership to better discharge their individual and collective responsibility for effective public relations; and (*e*) disseminate to the press, through well-organized press relations, the conclusions reached, papers presented, etc., in approved and usable press style.

The committee believes that the effectiveness of much earlier forestry work has been compromised because of the divergent and often contradictory material publicized; that a good deal of such material stems from limited information and understanding and serves to confuse the public. The committee recognizes that there will inevitably be differences in viewpoint and conviction, and that any attempt to prescribe or formalize doctrine would be as undesirable as it is futile. But the committee also holds strongly to the view that knowledge tempers judgments, that, paradoxical though it is, the best informed individual is the most careful of what he says. We strongly support the idea that the Society assume leadership in the matter of informing its members and in other ways qualifying them to do a creditable job of conveying forestry information to the public.

Recommendation 1

With respect to paragraph 1 of the committee's assignment, we believe that the following are among the basic facts upon which all foresters should reach agreement:

A. The forestry situation:

1. The total acreages of forest land which comprise the nation's forest resource, segregated regionally by types and classified ownerships.

2. The volume of timber growing on these acreages, in board feet, cubic feet, or other agreed units of commercial utilization.

B. The forestry problem:

1. Our forestry lands are not yet fully productive.

2. Certain simple and minimum forestry practices are required to maintain and increase the productivity of these forest lands:

a. Protection from fire, disease, and insects.

b. Provision for regeneration, either natural or artificial, when timber is harvested.

c. Approved methods of harvesting, defined by major forest types and regions.

d. Rehabilitation of idle lands not bearing a full timber crop.

e. Balancing timber production with depletion from all sources.

3. The multiple-use concept should be applied in the integrated production of forest lands.

4. Water control is a phase of forest management.

C. Solutions which in part will help make the nation's forest lands more productive:

1. Assistance on the ground to small owners.

2. Access roads to reach mature timber.

3. Continuing forest inventories.

4. More basic research in methods of timber management.

5. More complete utilization of the timber crop.

To each common agreement among federal, state, and private foresters on such basic facts, the committee recommends:

That the Society sponsor periodic public relation seminars or conservation and utilization work shops; these group meetings to be held at appropriate regional locations accessible to national forests, state forests, and tree farms, forest research stations, public and private land management projects, wood conversion centers, and wood utilization research depart-

ments. These seminars should be designed for and be attended by public relations specialists, educators, and writers of all agencies, including free lance writers and newspaper and periodical editors. The programs should be well planned and varied, and should include presentation of papers, study and evaluation of conditions on the ground, and critical analysis of publications from the standpoint of accuracy, objectives, and effectiveness as an instrument of public relations, and furthering the cause of forestry.

It is believed that seminars of this character can do much to achieve mutual understanding, agreement on facts, and a narrowing of the area of controversy in the forestry field.

How to get these basic facts to the public in language that a layman can understand?

The committee believes that foresters, above all other professional qualifications, must improve their technique in communicating with people orally and in writing.

To that end, the committee makes the following recommendations:

A. For graduate foresters already engaged in professional work; that:

1. The Society of American Foresters prepare a simplified textbook explaining the "how" of communicating with the public. This booklet should include chapters on how to prepare and place a news release; how to work with the press, news wire services, and radio stations; how to write feature material; how to arrange field trips and plant tours for editors; how to interest outside writers in doing stories on forestry. Such textbooks have been prepared by several companies and agencies and can be used as guides.

2. Where possible, these textbooks principles be explained by public relations specialists in special meetings, clinics, or classes held on a local level, working through the Society's sections.

3. The Society of American Foresters prepare a nontechnical glossary of forestry terminology, which could be the present technical glossary translated into more usable "public information" language.

4. All foresters invite local business men, educators, and writers to attend tree farm, wood conversion, and forest land management tours, so that the community is kept informed.

5. Local business men, civic leaders, editors, and writers be invited to attend Society and forestry meetings.

6. Foresters develop more displays, visual material, and models for public education, to be used at county fairs, in public buildings, schools, and at special occasions.

7. Foresters attend meetings of other industries and study their public relations techniques.

8. Foresters make a special effort to arrange conservation workshops and tours for teachers and students.

9. Articles prepared by local foresters which appear in the JOURNAL OF FORESTRY or other periodicals be abstracted for use in local newspapers, with full credit for the author, his Society membership, and the periodical.

10. Each Section appoint a public information committee whose function will be to announce Section meetings, arrange for press coverage of local meetings by appropriate releases, arrange for appropriate news releases covering the professional and special accomplishments of Society members in furthering the cause of forestry, and abstract for appropriate publication the published writings or meeting papers of local foresters.

B. For foresters still to be graduated or now in school; that:

1. That the curricula of the various schools of forestry include broader and more basic training in journalism, public speaking, and public writing, to the maximum extent feasible. Too many trained foresters have failed to appreciate the importance of gaining favorable public understanding of their work and of their profession. Too many of them cannot express themselves in oral or written public utterances in a manner which inculcates such favorable understanding. They do not realize that in this oversight they frequently place professionalism ahead of public demand.

2. That schools of forestry arrange for practicing foresters engaged in public information work to address student classes and seminars.

3. That a copy of this committee report be submitted to the Division of Education for its attention.

4. That the recommendations of A, above, be adopted after foresters graduate.

Recommendation 2

Keeping Key Individuals Informed. The committee recommends that:

1. Tree farm and forest land management tours be arranged regularly for local editors, educators, business men, school children, and free lance writers.

2. Plant tours be arranged on a similar basis to show the forest industry's progress in increasing wood utilization, creating new products, improving uses of existing products, and developing new technologies of manufacturing.

3. Foresters participate freely in civic club and other local community memberships, so that these memberships may serve as an entry to promote an understanding of the profession of forestry and its objectives and accomplishments.

4. Foresters cooperate closely with schools, by arranging trips, essay writing contests, and similar affairs to stimulate the interest of youth in forest conservation and utilization.

5. Tours for editors be made a special event, with the use of well-prepared "press kits," to include background material, photographs of professional quality and product, or other samples where needed.

6. All forestry happenings of local, regional, or national importance be reported to the press by local managers of tree farms, ranger districts, associations, and wood conversion plants.

7. Special events, such as tree farm, anniversary, and mill dedications, be planned wherever possible and that key people from the region affected (governors, mayors, Chambers of Commerce, etc.) be invited as guests or featured on the program.

8. Local businessmen and civic leaders be invited to attend forestry meetings and special demonstrations.

9. More frequent use be made of such terms as "he says but I think" in public statements, giving the reader or listener an opportunity for intelligent choice between dignified professional opinion.

10. More cooperative meetings and projects be arranged between state, private, and federal agencies.

11. Foresters acquaint themselves with public relations men, regardless of industry or forestry affiliations, who are carrying on successful informational programs.

12. Press books be prepared by individual companies, agencies, and associations, and that publications already prepared by used as a guide. An effort should be made to find phases of programs of other groups, officers, agencies, or associations that can be mutually supported, even though inter-

ests or basic idealogies of "doing the forest job" may conflict.

Recommendation 3

Inculcating in Society members a better understanding and appreciation of public relations techniques and programs.

The committee recommends that, in addition to following the guide outlined above:

1. Foresters attend meetings of other state, federal, and private agencies, not necessarily engaged in forestry work, to study public relations techniques being used.

2. Foresters attend field trips arranged by nonforestry groups, particularly plant tours.

3. Foresters study written reports on work of companies engaged in effective informational programs.

4. Foresters subscribe to public relations journals, through their agencies, or refer to them in libraries.

5. Foresters follow a "good neighbor" policy in community relations and consult forestry relations specialists for assistance as needed.

By Special Committee on Public Relations:

ALBERT ARNST, *Chairman*,
CHARLES S. COWAN,
CHARLES TEBBE,
WILLIAM S. SWINGLER,
J. C. MCCLELLAN,
ALBERT WEISENDANGER.

Biloxi, Miss.
December 14, 1951.

Intermountain Section Meeting

The Intermountain Section held its second annual spring meeting at Logan, Utah on April 12, 1952, with an attendance of 80 members and guests. Facilities for the gathering were made available through the courtesy of the Utah State Agricultural College. The program was devoted to presentation of the work being done by two of the public agencies in resource management in the West, the national forest administration of the U. S. Forest Service, and the Utah State Board of Forestry and Fire Control.

Those participating included Lowell G. Woods, supervisor, Fishlake National Forest; Lymon L. Richwine, district ranger, Spencer, Idaho; Ned D. Millard, district ranger, Cascade, Idaho; S. E. Cazier, district ranger, Pinedale, Wyoming; Archie A. Murchie, district ranger, Ely, Nevada; Andrew R. McConkie, district ranger, Heber, Utah; Clark Anderson, district ranger, Ogden, Utah; John E. Burt, deputy state forester, Logan, Utah; Dean Lewis M. Turner and J. Whitney Floyd, Logan Utah, and Regional Forester Chester J. Olsen, Ogden, Utah.

The Section was privileged to have George L. Drake, president of the Society, attend the meeting and enjoy the benefit of his remarks on Society affairs and his excellent address as principal speaker at the evening banquet.

New officers elected were William L. Robb, chairman; James Mielke, vice chairman, and James D. Curtis, Secretary-treasurer.

JAMES D. CURTIS,
Secretary.

NEW OFFICERS of the Ozark Section elected at the annual meeting in Fayetteville, Arkansas February 9, 1952. *Left* to *right*: Nat Walker, Oklahoma A & M College Forestry Department, retiring chairman; Dave Campbell, International Paper Company, Camden, Ark, new chairman; Peter W. Fletcher, forestry staff, University of Missouri, Columbia, vice chairman; Albert Engstrom, Oklahoma Planning and Resources Board, Oklahoma City, secretary-treasurer.

Allegheny Section to Meet

The annual summer meeting of the Allegheny Section will be held September 19 and 20 near Oakland, Md. The site of the meeting will be the Herrington Manor Recreation Area, in the Swallow Falls State Forest. This is five miles north of Oakland, which is in Garrett County, in the extreme southwest corner of western Maryland.

Members will be housed in state park cabins. Lodging is also available in Oakland.

Additional information about the program and arrangements may be obtained from Secretary H. R. Frantz, INCODEL, Dodson Building, 528 N. New Street, Bethlehem, Pa.

Candidates for Membership

Candidates for admission (except those for Student Member grade), advancement, or reinstatement whose membership applications were received in the Society office during the month of May are listed below.

Action regarding the eligibility of these candidates will be taken by the Council as of August 1, 1952. Any communications from voting members relating to the membership eligibility of any of these candidates should be received in the Society office prior to that date.

The names of these candidates who become members of the grades for which they have applied will be published in subsequent issues of the JOURNAL OF FORESTRY.

Allegheny Section

Junior Grade

Byrnes, W. R., Instructor, Pa. State College, Dept. of Forestry State College, Pa.; Pa. State, B.S.F., 1950, M.F., 1951.

Klingman, R. E., Lumber Inspt., Lewisburg Chair and Furniture Co., Lewisburg, Pa.; W. Va. Univ., B.S.F., 1951.

Perry, G. C., Foreman, Asplundh Tree Expert Co., Jenkinstown, Pa.; Univ. of Maine, B.S.F., 1949.

Thayer, R. T., Asst. Dist. Forester, Md. Dept. of Forests and Parks, Westminster, Md.; W. Va. Univ., B.S.F., 1950.

Wine, R. C., Sales Repre., F. A. Bartlett Tree Expert Co., Wilmington, Del.; Pa. State, B.S.F., 1950.

Student Members Proposed for Advancement

PENNSYLVANIA STATE COLLEGE

Eckelmann, G. F.; Gerhold, H. D.; Getz, J. R.; Holt, W. R.

Member Grade

Cottrell, A. T., Director, Adm. Div. Cons. and Economic Development, Trenton, N. J.; Boston Univ., B.B.A., 1924; Yale, M.F., 1926. Reinstatement.

McNasser, K. W., Staff, Asst., Div. of Information and Education, Philadelphia, Pa.; State Univ. of New York, B.S.F., 1933, (Junior, 1947).

Megnin, V. U., Stave & Heading Inspt., Hunter-Wilson Distilling Co., Oil City, Pa.; State Univ. of New York, B.S.F., 1941, (Junior, 1949).

Schreiber, C. P., Supt., National Park Service, Farmington, Pa.; Pa. State, B.S.F., 1938, (Junior, 1948).

Appalachian Section

Junior Grade

Student Members Proposed for Advancement

NORTH CAROLINA STATE COLLEGE

Bennett, J. W.; Blanchard, G. M.; Crook, J. D., Jr.; Dorward, R. E.; Eggleston, R. H.; Gresham, H. H.; Hardin, T. N.; Harris, H. G.; Hinshaw, J. S.; Hughes, S. M.; Jackson, C. A., Jr.; Jordan, E. N.; Ledgetter, J. I.; LeRoy, J. L.; Morison, D. W.; Peroni, G. P.; Phelps, R. B.; Reid, J. B.; Reyns, R. G.; Ross, V. R.

Member Grade

Harley, B. R., Forester, Turnell and Morgan, Elizabethtown, N. C.; N. C. State, B.S.F., 1940. (Junior, 1949).

Associate Grade

Chapman, G. V., Mgr., Production and Research, Drexel Furniture Co., Drexel, N. C.; Duke Univ., A.B., 1925.

Central Rocky Mountain Section

Junior Grade

Student Members Proposed for Advancement

COLORADO A & M COLLEGE

Griffith, T. L.; Housley, R. M.; Jones, S. H.; Robertson, J. R.; Stithem, J. K.; Tidball, R. R.

Central States Section

Junior Grade

Sample, J. L., Owner and Supv., Forest Land.

Madison, Ind.; Purdue, B.S., (Forestry), 1916. (Affiliate, 1950).

Student Members Proposed for Advancement

MICHIGAN STATE COLLEGE

Bloomer, A. W.; Curtis, F. H.; Ditzhazy, J. A.; Kickbusch, W. L.; Laverdiere, R. J.; McCullough, S. W.; Miracle, K. R.; Osborne, C. E.; Sherrill, B. C.; Silver, S. O.; Smalley, G. W.; Spelman, K. W. Sprenger, G. E.; Striffler, W. D.; Tarbox, G. L.

PURDUE UNIVERSITY

Barnett, D. A.; Davis, H. O.; Devers, C. S.; Draper, L.; Fransisco, G. M.; Johnson, F. H.; Kolger, W. A.; Myers, P. M.; Pajkowski, E. J.; Read, R. M.; Smith, R. M.; Steiner, J. P.; Wengert, R. H.

UNIVERSITY OF MICHIGAN

Anderson, P. A.; Brooks, W. B.; Carbaugh, P. M.; Clee, N. F.; Coleman, J. H.; Giuntoli, J. A.; Glass, T. D.; Heath, M. W.; Mason, R. R.; McQuinn, T. C.; Olson, C. E.; Pappalardo, V. J.; Schemnitz, S. D.; Smith, B. E.; Stephen, G. C.

Member Grade

Boelter, A. H., Farm Forester, Mich. Dept. of Cons., Saginaw, Mich.; Mich. College of Mining and Tech., B.S.F., 1943. (Junior, 1950).

Harper, R. M., Dist. Rgr., U.S.F.S., Manistee, Mich.; Mich. State, B.S.F., 1924. (Junior, 1936R51).

Columbia River Section

Junior Grade

Young, E. S., Logging Supt., Crown Zellerbach Corp., Portland, Oreg.; Oregon State, B.S.F., 1921.

Student Members Proposed for Advancement

OREGON STATE COLLEGE

Dane, C. W.; Gingery, D. H.; Houghton, G. V.; Jennings, R. B.; Johnson, D. H.; Krogh, A. W.; MacKenzie, D. E.; Nautel, W. G.; Palen, K. R.; Petrie, K.; Rhodes, M.; Rogers, G. D.; Schappell, J. N.; Scott, T. O.; Smith, G. S.; Smith, N. R.; Smith, R. E.; Stoll, A. K.; Stroup, E. D.; Trout, M. F.; Usher, V. H.

Member Grade

Shelley, R. S., 375 Garden Way, Eugene, Oreg.; Oregon State, B.S.A., 1904. Reinstatement.

Affiliate Grade

Henry, R. E., Mgr., Timber Dept., Southern Oregon Plywoods, Inc., Portland, Oreg.

Associate Grade

Stevens, R. E., Forester, Oregon State Board of Forestry, Salem, Oreg.; Oregon State, B.S., (Entomology), 1951.

Gulf States Section

Junior Grade

Moody, F. B., Grad. Student, Univ. of Fla., Gainesville, Fla.; Univ. of Fla., B.S.F., 1951. B.S.F., 1922. Reinstatement.

Student Members Proposed for Advancement

LOUISIANA STATE UNIVERSITY

Alison, T. W.; Baldwin, M. S.; Bengtson, G. W.; Carroll, R. L.; Foster, R. C.; Ford, E. M.; Hatchell, G. E.; Huff, P. R.; Lawrason, T. B.; Parker, J. W.; Walton, R. A.; Wilkins, E. C.

Member Grade

Ittel, P. M., Dist. Forester, Int. Paper Co., Mobile, Ala.; Pa. State, B.S.F., 1942. (Junior, 1946).

Smith, M. R., Dist. Supt., Int. Paper Co., Bastrop, La.; La. State, B.S.F., 1937. (Junior, 1948).

Affiliate Grade

Chandler, R. R., Forester, Tremont Lbr. Co., Joyce, La.; L.P.I., B.S., (Forestry), 1950.

James, M., Area Forest Rgr., Miss. Forestry Comm., Hazlehurst, Miss.

Inland Empire Section

Junior Grade

Morris, B. W., Pierce Ranger Sta., Pierce, Idaho; Mont. State, B.S.F., 1950.

Stubbs, J. W., Instructor, Dept. of Forestry and Range Management, State College of Wash., Pullman, Wash.; Wash. State, B.S.F., 1939. Reinstatement.

Student Members Proposed for Advancement

Crabb, W. F.; Fellin, D. G.; Herman, K. E.; Johnson, R. A.; Knoerr, K. R.; Lorts, J. G.; Pearrs, R. S.; Saecheck, W. A.

Intermountain Section

Member Grade

Naanes, E. R., Asst. Rgr., U.S.F.S., Salmon, Idaho; Colo. A & M., B.S.F., 1942. (Junior, 1946).

Kentucky-Tennessee Section

Junior Grade

Myers, C. R., Cartographic Survey Aide, Geological Survey, U. S. Dept. of Interior, Morehead, Ky.; W. Va. Univ., B.S.F., 1952.

STOP FIRE!
WITH THE
ROME
FIRE SUPPRESSION
PLOW
The Rome Fire Suppression Plow is a sturdy unit designed and manufactured to prevent costly breakdown and loss of time. It has been thoroughly field tested. All basic plow parts are interchangeable.
WRITE US for detailed specifications and name of your nearest dealer.
ROME PLOW COMPANY
Manufacturers of
Rome Disk Plowing Harrows
CEDARTOWN, GEORGIA, U. S. A.

New England Section

Junior Grade

Maloney, R. C., Engr. Aide, U S Geological Survey, Augusta, Me.; Mont. State, B.S.F., 1951.

Richmond, H. L., Laborer, Univ. of Mich., School of Natural Resources, Ann Arbor, Mich.; Univ. of Mich., B.S.F., 1952.

Student Members Proposed for Advancement

UNIVERSITY OF MAINE

Connolly, R. A.; Gove, W. G.; Ingalls, A. E.; Laurin, G. F.; Marple, W. L.; Moir, H. D.; Mount, P. R.; Ouellette, D. J.; Rose, L. E.; Wave, H. E.; Wentworth, D. F.

UNIVERSITY OF MASSACHUSETTS

Raymond, E. W.; Stephens, G. R.

YALE UNIVERSITY

Hartley, M. E.; Skeele, J. R.

Member Grade

Gray, N. H., Forester, C. B. Cummings and Sons, Norway, Me.; Univ. of Me.; B.S.F., 1934. (Junior, 1945).

Affiliate Grade

Hawkensen, L. W., Purchasing Agent, Brown Co., Berlin, N. H.; Univ. of N. H., B.S.F., 1949.

New York Section

Junior Grade

Porter, J. S., Grad. Student, State Univ. of New York, Syracuse, N. Y.; Yale, B.E., 1942; State Univ. of New York, M.F., 1952.

Student Members Proposed for Advancement

STATE UNIVERSITY OF NEW YORK

Bauerle, A. L.; Erion, D. E.; Glowka, A. M.; Hoare, F. J.; Hoelle, P. A.; Howell, E. V.; Levine, R. McGann, J. R.; McKee, G. A.; Merrick, J. W.; Noble, C. L.; Robillard, W. G.; Rose, D. N.; Shim, S. J., Webster, H. H.; Weil, J. S.

Affiliate Grade

Morris, A. S., Woods Supt., Pembroke Shook Mills, Pembroke, Ontario, Canada; Univ. of Toronto, B.S., (Forestry), 1951.

Northern California Section

Junior Grade

Furtado, F. A., Park Rgr., Natl. Park Service, Mill Valley, Calif.; Univ. of Calif., B.S.F., 1949.

Parkinson, J. N., Forester, U.S.F.S., North Fork, Calif.; W. Va. Univ., B.S.F., 1950.

Member Grade

McGuire, K. B., Logging Supt., Caspar Lbr. Co., Caspar, Calif.; Oregon State, B.S.F., 1926. (Junior, 1926R49).

Affiliate Grade

Koledin, E. M., Fire Control Aide, U.S.F.S., Big Creek, Calif.; Univ. of Wash., B.S., (Botany), 1948.

Northern Rocky Mountain Section

Junior Grade

Student Members Proposed for Advancement

MONTANA STATE UNIVERSITY

Branch, D. W.

Ozark Section

Junior Grade

Student Members Proposed for Advancement

Aikins, R. E.; Ferguson, A. C.; Grate, D. A.; Kerr, R. S.; Kunz, R. H.; Neebe, D. J.; Pallo, F. B.; Robinson, J. H.; Taylor, R. F.

Puget Sound Section

Junior Grade

Geoghegan, R. E., Logging Engr., Puget Sound Pulp and Tbr. Co., Bellingham, Wash. Univ. of Wash., B.S.F., 1949.

Lewis, L. L., 13400 48th Ave., S., Seattle, Wash.; Univ. of Wash., B.S.F., 1940.

Southeastern Section

Junior Grade

Boyd, W. P., Jr., Forester, Pinelands Co. of Fla., Blountstown, Fla.; Univ. of Fla., B.S.F., 1949.

Nicholson, J. D., Diorama Exhibit Operator, Southern Pulpwood Cons. Assn., Atlanta, Ga.; Univ. of Fla., B.S.F., 1949.

Otterberg, R. C., Forester, M. W. Smith Lbr. Co., Inc., Jackson, Ala.; A.P.I., B.S.F., 1949.

Smith, J. H., Forester, Hollingsworth and Whitney Co., Mobile, Ala.; A.P.I., B.S.F., 1949.

Student Members Proposed for Advancement

ALABAMA POLYTECHNIC INSTITUTE

Caylor, D. A.; Dillon, S. T.; Dunn, H. V.; Rollins, C. W.; Sharp, J. D.; Tanner, R. G.; Walker, L. B.; Zingelmann, W. H.

UNIVERSITY OF FLORIDA

Drake, D. T.; Haines, L. W.; Heintz, R. H.; Holland, R. D.; Lake, E. R.; Mace, M. C.; Moak, J. E.; Moore, S. P.; Snaidman, W. C.; Willis, R. O

UNIVERSITY OF GEORGIA

Arnette, T. E.; Gray, W. D.; Gray, J.; Hedden, R. E.; Johnston, C.; Mabe, W. G.; Middlebrooks, B. S.; Nash, R. N.; Preston, D. N.; Radford, A. L.; Tanner, E. G.; Thompson, W. N.; Walker, G. D.; Walker, W. W.; Webb, C. H.; Welch, W. L.

Affiliate Grade

Davis, B. M., Dist. Supt., Int. Paper Co., York, Ala.; A.P.I., B.S., (Agric. Engr.), 1943.

West, A. A., 1101 Old Fort Drive, Tallahassee, Fla.; Univ. of the South, B.S., (Forestry), 1951.

PROPER PRUNING WILL PROTECT YOUR TREES

Bartlett offers quality saws for immediate delivery.

No. 127—PARAGON SAW. This curved blade saw is pruning perfection. Ideal for all around pruning jobs. Quality tool steel. Easy grip handle. 12 in.

No. 176—10 in. Forester's Saw. A splendid saw for large or small limbs. Has teeth to cut on both pull and push strokes. Extra large handle permits use of gloves.

No. 1248—21 in. Special Utility Saw. Big husky streamliner has teeth made like fast cutting saws. Has tree detached from the ground so the operator finds it easy to use and easy to recondition.

PRUNING KNIFE SPECIAL

No. 7303 Budding & Pruning Knife, 4½" long, 2" blades, bone stag handle (Wt. 3 oz.). Best Quality. Other types. Price each $3.85 Postpaid.

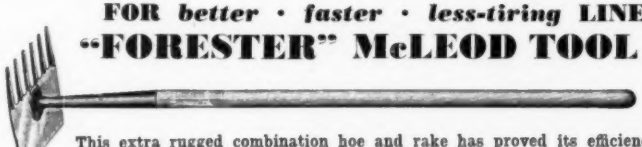
Ask about authoritative bulletins on tree care and catalog No. 32 showing complete line.

BARTLETT MFG. CO.
BOX 15, 3003 E. GRAND BLVD.
DETROIT 2, MICHIGAN

When writing to advertisers please mention that you saw it in the JOURNAL OF FORESTRY.

FOR *better* • *faster* • *less-tiring* LINE BUILDING

"FORESTER" McLEOD TOOL



Complies with U. S. FOREST SERVICE Specifications No. 355

This extra rugged combination hoe and rake has proved its efficiency over more than 30 years, as the basic tool for fire line construction in the Ponderosa Pine regions of the Western States.

It is the standard tool of the U. S. FOREST SERVICE and of many State Forestry Departments. It excels in deep litter, matted cover, small brush and similar fuels found in open pine types.

12 Gauge, tempered steel head 11" wide with 5" hoe blade and 3½" rake tines. Straight grain ash handle 48" long.
McLEOD TOOL . . $5.25

• •

"KORTICK TYPE" 6.75
[with demountable head]

WESTERN FIRE EQUIPMENT COMPANY
67 MAIN STREET • SAN FRANCISCO 5

Southern California Section

Junior Grade

Lovingfoss, V. W., Jr., Civil Engr., State of Calif., Div. of Highways, San Luis Obispo, Calif.; Mont. State Univ., B.S.F., 1950.

Affiliate Grade

Banks, R. H., Asst. State Forest Rgr., Calif. Div. of Forestry, Riverside, Calif.
Britt, T. V., Sales Representative, American Lbr. and Treating Co., Los Angeles, Calif.; State College of Wash., B.S., (Forestry), 1949.

Upper Mississippi Valley Section

Junior Grade

Student Members Proposed for Advancement

IOWA STATE COLLEGE

Campen, E. R.; Hanna, S. P.; Hawk, H. E.; Haygreen, J. G.; Nelson, J. P.

UNIVERSITY OF MINNESOTA

Batzer, H. O.; Beaufait, W. R.; Brown, B. A.; Cross, G. C.; Hagenstein, P. R.; Hillman, J. K.

Member Grade

Ellerhoff, M. A., Supt. of Forestry, State Cons. Comm., Des Moines, Iowa; Iowa State, B.S.F., 1936. Reinstatement.
Johnson, R. W., Asst. Prof. Botany and Biology, Bethel College, St. Paul, Minn.; Univ. of Minn., B.S.F., 1935; M.F., 1947.

Wisconsin Upper Michigan Section

Junior Grade

Haack, P. M., 3552 N. 21st St., Milwaukee, Wis.; Univ. of Minn., B.S.F., 1949.
Johnson, V. W., Assoc. Prof. of Forestry, Mich. College of Mining and Tech., Houghton, Mich.; State Univ. of New York, B.S.F., 1937; M.F., 1939. Reinstatement.

Affiliate Grade

Morse, F. S., Forester, Wis. Cons. Dept., Hayward, Wis.; Univ. of N. H., B.S.F., 1950.
Spoerl, G. A., Cons. Aide, Wis. Cons. Dept., Wisconsin Rapids, Wis.; Mich. College of Mining and Tech., B.S.F., 1950.
Veeser, W. L., Forester, Upper Peninsula Power Co., Houghton, Mich.; Mich. College of Mining and Tech., B.S.F., 1949.

Foreign

Corresponding Grade

Carlier, J. L., Director and Member Executive Board, Office D'Approvisionnement des Charbonnes Belges, Gare-Eelen, Belgium; Univ. of Louvain, (Belgium), A.E., 1936; F.E., 1937.

New Members and Advancements

Individuals who became members of the grades indicated during the month of May are listed below. They are eligible for participation in activities of the Society of American Foresters, including meetings and projects of Sections, Chapters, Divisions, and Committees.

Allegheny Section

Student Grade

PENNSYLVANIA STATE COLLEGE

Gilmore, R. C. Wilce, J. C.
Setiz, L. J.

Junior Grade

Babbitt, R. P., West Virginia Pulp and Paper, Tyrone, Pa.
Harding, M. J., 34 Campbelle Ave., Clarion, Pa.
Middleton, J. B., Jumonville Rd., Uniontown, Pa.
Nelson, C. N., Kane, Pa.
Ross, R. E., 22 Jackson Way, Titusville, Pa.
Waddell, H. T., Box 223, Pleasantville, Pa.

Member Grade

Brockman, R. L., 832 Elk St., Franklin, Pa.
Lyman, R. R., Coudersport, Pa.
Underwood, J. A., East Springfield, Pa.
Ward, W. W., Mont Alto State Forestry School, Mont Alto, Pa.

Appalachian Section

Student Grade

NORTH CAROLINA STATE COLLEGE

Jackson, J. V.

Central States Section

Student Grade

MICHIGAN STATE COLLEGE

Bonner, D. F. Prior, J. W.
Hubbard, R. G. Vorselen, A. L.
Leist, E. J. Young, R. F.
Ott, J. H.

Junior Grade

Aldon, E., 2853 W. Berteau, Chicago, Ill.
Drummond, W. G., 729 E. 48th St., Indianapolis, Ind.
Thompson, L. S., Box 71, Marion, Mich.

Affiliate Grade

Abe, E. W., 234 North Madison, Peoria, Ill.

Associate Grade

Coulter, L. L., 247 Itzen Court, South Haven, Mich.
Farlow, P. R., Ill. Central R.R. Co., Chicago, Ill.

Columbia River Section

Student Grade

OREGON STATE COLLEGE

Chamberlin, D. C. Groves, G. M.
Doty, O. H. Olson, L. V.
Trost, D. O. Rodgers, C. E.

Use EAGLE Tree Markers

Eagle Duo-hydraulic Tree Marking Guns make tree marking easy, positive and fast. Just aim the nozzle at the tree and press the trigger lever. That's all! Paint sprays freely. Simple to take apart and clean. No clogging parts. Guaranteed against leakage. ¾, 1 and 2 pint capacities.

FOR SPECIAL NUMBERING JOBS USE THE EAGLE SUPER #66

All brass piston type gun. Tree tested on 40,000 Lake States Region trees. Takes undiluted but strained outside paint. Won't leak.

Order from your Supply Dealer or write for further information.

EAGLE MANUFACTURING COMPANY Wellsburg, West Va.

STOP THAT FIRE

RANGER PAL JR. FIRE PLOW

The Ranger Pal Junior fire plow is a hand or hydraulic lift middle-buster with coulter and discs. Drawbar connection built of 1" cast steel T-beam. Has 16" coulter roller bearing assembly with grease seal, mounted ahead of 14" tempered steel middle-buster, capable of cutting large underground roots. One 16" harrow disc bearing assembly is mounted on each side and slightly behind the middle-buster wing which turns the sod over and out. Depth of plowed line may be adjusted by either the presence or absence of two spool weights attached on rear of plow. Leaves a 5 foot earth line and can be drawn by any piece of light equipment, Ford type tractor, jeep or power wagon. Built compact and sturdy for ease in handling and reduced maintenance costs. Tested and proven by Louisiana Forestry Commission. Made by makers of Ranger Pal Fire Plow. Not designed to supersede the Ranger Pal but adapted for lighter equipment. Mass production price at $385.00 each, f.o.b. shop. Workmanship guaranteed.

Ranger Pal Fire Plow production price at $495.00 each f.o.b. shop. Write for further details on both plows.

TWIN CITY WELDING & MACHINE SHOP
301 Jonesboro Highway
WEST MONROE LOUISIANA

Junior Grade

Clark, J. W., Box 4137, Portland, Oreg.
Colee, E. B., 1601 E. 10th St., The Dalles, Oreg.
Engstrom, W. H., 909 Mill St., Salem, Oreg.

Member Grade

Andreassen, W. K., Box 792, Veneta, Oreg.
Hermann, A., 7733 S. E. 13th Ave., Portland, Oreg.
Lound, F. E., c/o Edward Hines Lbr. Co., Hines, Oreg.
McDonald, J. E., U.S.F.S., Lakeview, Oreg.

Affiliate Grade

Kobelin, D. W., Box 705, Bend, Oreg.

Gulf States Section

Junior Grade

Kent, N. C., Crystal Springs, Miss.
Palpant, E. H., 724 Beresford St., Vicksburg, Miss.

Member Grade

Sessions, L. C., Box 649, Jackson, Miss.

Affiliate Grade

Bond, W. L., Box 251, Vicksburg, Miss.
Jeter, C. H., 604 Ardis Bldg., Shreveport, La.

Inland Empire Section

Student Grade

UNIVERSITY OF IDAHO

McGill, T. F. — Steffensen, L. M.

Junior Grade

Silvernale, C. W., U.S.F.S., Grangeville, Idaho
Walker, W. R., Star Route, Pierce, Idaho

Intermountain Section

Student Grade

UTAH STATE AGRICULTURAL COLLEGE

Brann, M. F.

Kentucky-Tennessee Section

Junior Grade

Garner, R. D., c/o Engineer V.A. Hospital, Murfreesboro, Tenn.
Haskins, E. B., 509 Campbell Ave., Tullahoma, Tenn.

New England Section

Student Grade

UNIVERSITY OF MAINE

Bennett, D. R. — Simpson, H. L.
Crosman, D. T.

Junior Grade

Merchant, G. C., c/o Paris Mfg. Co., West Milan, N. H.

Member Grade

Bessey, E. B., 37 Johnson Heights, Waterville, Me.

New York Section

Student Grade

STATE UNIVERSITY OF NEW YORK

Daniell, F. L. — Suters, P.
Seaman, J. D.

Northern California Section

Student Grade

UNIVERSITY OF CALIFORNIA

Hamilton, F. E. — Oyung, F.

Junior Grade

Weaver, R. W., King City, Calif.

Member Grade

Helgeson, R. L., Box 44, Truckee, Calif.
May, R. H., Calif. Forest and Range Exp. Sta., Berkeley, Calif.

Northern Rocky Mountain Section

Member Grade

Pomajevich, J. M., Box 502, Thompson Falls, Mont.

Ozark Section

Junior Grade

Plummer, J. L., Eminence, Mo.
Priegel, E. R., Box 20, California, Mo.
Tinker, F. E., 118 Dyer St., Malvern, Ark.

Member Grade

Sands, W. M., 1225 Louisville Blvd., St. Louis, Mo.

Puget Sound Section

Junior Grade

Banta, D. G., 944, Ketchikan, Alaska
Petzold, A. O., Box 219, Shelton, Wash.

Member Grade

Tucker, L. A., Box 350, Olympia, Wash.

Affiliate Grade

Meeley, J. M., Rayonier Inc., Sappho, Wash.

Southeastern Section

Student Grade

UNIVERSITY OF FLORIDA

Jones, B. M.

UNIVERSITY OF GEORGIA

Daniell, J. T. — Holt, V. J.
Dunlap, R. R. — Skuse, J. A.
Edwards, S. — Tucker, G. L.

Junior Grade

Haynes, J. D., 13-C Druid Gardens, Tuscaloosa, Ala.
Johnson, W. A., Box 1076, Mobile, Ala.
Lewis, D. J., 2237 Herschel St., Jacksonville, Fla.
Sellers, J. D., 411 College St., Greenville, Ala.

Southwestern Section

Junior Grade

Shumate, J. B., Luna Ranger Sta., Luna, N. Mex.

Member Grade

Schilling, E. A., Post Office Bldg., Albuquerque, N. Mex.

Upper Mississippi Valley Section

Student Grade

IOWA STATE COLLEGE

Conner, R. C. — Micklewright, J. T.

UNIVERSITY OF MINNESOTA

Keller, R. C.

Member Grade

Worrall, D. C., 408 8th St., Cloquet, Minn.

Associate Grade

Layton, R. J., 804 Chautauqua Blvd., Valley City, N. Dak.

Washington Section

Junior Grade

Roos, M., 3140 Wisconsin Ave., N.W., Washington, D. C.

Member Grade

Pammel, H. E., U. S. Soldiers Home, Washington, D. C.

Wisconsin-Upper Michigan Section

Junior Grade

Martin, F. R., Necedah Natl. Wildlife Refuge, Necedah, Wis.
Valimaki, O. A., Traunik, Mich.
Wepfer, R. W., 2555-A North Humboldt Ave., Milwaukee, Wis.

GROW TREES
FOR XMAS TREES AND FORESTRY
Fir, Pine and Spruce in Variety
Seedlings and Transplants
Write for Price List
Suncrest Evergreen Nurseries
P. O. Box. 643, Johnstown, Pa.

FORESTRY SUPPLIERS,
INCORPORATED
Battlefield Station
Jackson 4, Mississippi
Successors To
Jim Craig Supply Service

BRIGHT SPOT
TREE MARKING PAINT
Blue—White—Yellow—Red—Orange

- Double Strength — user can dilute with equal amount of kerosene to make spray consistency for pine.
- Saves Time—mixes easily and quickly; does not clog the gun.
- Low Cost — per gallon prices are:

In 5 gallon Pails, 50 gallons and more	$1.50
In 5 gallon Pails, less than 50 gallons	1.60
In 1 gallon cans, 4 to case, 52 gallons and more	1.60
In 1 gallon cans, 4 to case, less than 52 gallons	1.70

We pay freight up to ten cents per gallon on orders of 20 gallons and more.

Also Available
BRIGHT SPOT
BOUNDARY LINE PAINT
Write for Prices

The Improved
B-10 TREE STICK
Does most of your figuring.
Volumes in cords, on the stump; tally as you mark; estimates by Scribner, Quebec, International rules and lumber scale; tree and acre growth predictions; easy basal area; lumber scale of logs. Hard maple stock. Stick and leaflet, $3, delivered. Quantity discounts.
FRED. B. MERRILL
ZACHARY, LA.

BELSAW ... Over 30 Years in the Development and Manufacture of
PORTABLE SAWMILL EQUIPMENT
Thousands of Belsaw Portable Sawmill users throughout the world . . . Belsaw goes right to the trees, thus getting more lumber from all the cut timber. For low cost, high quality production the Belsaw line leads the field. Write today for Free Book, "How To Make Lumber."
BELSAW MACHINERY CO
8912 Field Building, Kansas City 2, Missouri

Forestry News

R. E. McArdle Succeeds Lyle F. Watts, Chief, U. S. Forest Service

Appointment of Richard E. McArdle as chief of the Forest Service, U. S. Department of Agriculture, has been announced by Secretary Brannan. He succeeds Lyle F. Watts, chief for the past nine years, who retired from active duty June 30.

Paying tribute to Mr. Watts, Secretary Brannan said: "He has been one of the most effective and courageous leaders of the Forest Service in the great tradition of its service to the American people. Under his guidance, forestry has taken a much greater part in the agricultural resources conservation program and has become an essential part of American agriculture."

In recognition of his outstanding public service, Mr. Watts, in 1950, received the Department of Agriculture's distinguished service award "for distinguished and effective leadership in advancing the conservation of forest resources in the United States and internationally."

Mr. McArdle has been a member of the Forest Service for more than 25 years. Since 1944 he has served as assistant chief in charge of cooperative forestry programs. Under his leadership the federal programs carried on in cooperation with the states to encourage and facilitate the protection and sound management of the country's forests have been greatly accelerated.

A native of Lexington, Ky., McArdle is a graduate of the University of Michigan, where he received the B.S. degree in forestry in 1923 and M.S. in 1924, and a Ph.D. degree in 1930. He served as part-time instructor in forestry at the University of Michigan from 1927 to 1930.

McArdle entered the Forest Service as a junior forester in 1924 and was assigned to the Pacific Northwest Forest and Range Experiment Station. Following a three-year leave of absence for graduate study he returned to the Forest Service to continue his research work in 1930. In 1934 he accepted appointment by the University of Idaho to head its school of forestry. He returned to the Forest Service in 1935 to become director of the Rocky Mountain Forest and Range Experiment Station at Fort Collins, Colo., and three years later he became director of the Appalachian Forest Experiment Station, Asheville, N. C. In 1944 he was brought to Washington, D. C. as assistant chief of the Forest Service, in charge of state and private forestry cooperation, the position he has held to date.

McArdle is a member of Sigma Xi, Scientific Honor Society, and has been a member of the Council of the Society of American Foresters since 1948.

Mr. Watts is chairman of the standing Advisory Committee on Forestry of the United Nations Food and Agricultural Organization. He took an active part in the organization and development of the forestry branch of FAO.

Iowa State College has conferred on Mr. Watts an honorary doctor's degree and its alumni merit award. He was also presented the Croix du Chevalier de la Merite Agricole by the French Government.

He is a Fellow of the Society of American Foresters.

Mr. Watts was born in Cerro Gordo County, Iowa in 1890. He received a B.S. degree in forestry at Iowa State College in 1913 and earned the M.S. degree at the same institution in 1928. He entered the Forest Service July 1, 1913, as a technical assistant in the Wyoming National Forest. He advanced rapidly in national forest administration, serving successfully as assistant supervisor of the Boise National Forest in Idaho, as supervisor of the Weiser and the Idaho national forests, and as forest inspector working out of the Ogden, Utah regional office.

During a leave of absence from the federal service in 1928 and 1929, Mr. Watts organized the forestry school at Utah State Agricultural College. He returned to the Forest Service to engage in research work at the Intermountain Forest and Range Experiment Station in Ogden. In 1931 he was named director of the Northern Rocky Mountain Forest and Range Experiment Station at Missoula, Mont. From 1936 to 1939 he served as regional forester of the Central Region. He then became regional forester of the Pacific Northwest Region.

In 1942 Mr. Watts was called to Washington, D. C., to take charge of the wartime farm labor activities of the department at Washington. The following year he was named chief of the Forest Service.

RICHARD E. MCARDLE
. . . new chief.

LYLE F. WATTS
. . . retiring after 40 years.

Cook Named Chief Forester, National Park Service

Lawrence F. Cook has been appointed to succeed Chief Forester John D. Coffman, who retired from the National Park Service on May 31 after a long and distinguished career with the federal government. Mr. Cook has been assistant chief forester since 1937, and has been with the National Park Service since 1924.

Cook worked as a park ranger in Sequoia National Park, Calif. He remained in this park for about 10 years, attaining the rank of chief park ranger. He then transferred to Berkeley, Calif., to take charge of the western division of the Forestry Branch of the National Park Service. In this position, he supervised forestry activities in parks and monuments west of the Mississippi River. With the regionalization of the Park Service in 1937, the Berkeley office was discontinued and he was transferred to Washington, D. C., to serve as assistant chief of the Forestry Division.

The new chief forester is a native of Newton Center, Mass., and has a B. S. degree in forestry from the New York State College of Forestry. He is the author of the publication *The Giant Sequoias of California*, published by the National Park Service in 1942, and is a member of the Society of American Foresters, the American Association for the Advancement of Science, and the Ecological Society of America.

Lumbermen Discuss Forestry, Past, Present, Future

At the 50th Anniversary meeting of the National Lumber Manufacturers Association May 8-10 in St. Louis, Mo., John B. Veach, president of the association and president, Hardwood Corporation of America, Asheville, N. C. stated, "if increase in tree growing continues through the next 10 or 15 years, and there is every reason to assume that it will, and if the per capita consumption of lumber continues to decline, we will have trees running out our ears . . . I certainly am not worried for the future as to the availability of raw material, but I am worried about our markets."

At a forestry session, lumber industry leaders summarized the accomplishments and progress in private, state, and federal forestry during the past fifty years. Chairman of the session was Hillman Lueddemann, president of West Coast Lumbermen's Association and vice president, Pope & Talbot, Inc., Portland Ore.

The lead-off speaker, N. F. McGowin, president, W. T. Smith Lumber Company, Chapman, Ala., traced operations of the lumber industry in the South. Of his own company, he said "many years ago we established a program of cutting which has never been changed. That method is a pure selective cut which removes only the defective and crowded trees and leaves the best trees of all sizes standing as a growing stock. Within the economic limits possible, cutting practices are designed to keep the timbered area continuously productive and as far as possible increase the volume and improve the quality of the stand. At each of the last fifteen annual meetings of our company I have been able to say to our stockholders that 'you now own more timber than you did last year.' "

Speaking on private forestry in the Pacific Northwest, J. P. Weyerhaeuser, Jr. president of Weyerhaeuser Timber Company, Tacoma, Wash., said "forestry is essentially a development which must be based upon a sound economic background. Slowly but surely this necessary evolution has taken place." Weyerhaeuser concluded by saying that the industry has emerged from the early exploitive days when vast virgin forests were available at little or no cost to a new dynamic era of timber growing. He said the national economic scene has changed, that today conservative harvests, reforestation, and close utilization are profitable investments, whereas fifty years ago they were merely impractical theories. He called for gradual reduction of federal aids and less emphasis on statutory measures to achieve sound management, with more emphasis on the economics of timber growing and re-evaluation of the desirable balance in resource ownership.

Progress in forestry of the Lake States and the Northeast was set forth in a speech by Ernest Broderick, secretary, Northeastern Lumber Manufacturers Association, New York City, for Rand N. Stowell, Timberland, Inc., Dixfield, Maine. The state forestry picture was presented by Fred Lang, state forester of Arkansas and president of the Association of State Foresters. Federal forestry progress over the past fifty years was brought out by Richard McArdle, assistant chief of the U.S. Forest Service, Washington, D. C.

Taking "A Look Ahead" at forestry, Col. W. B. Greeley, vice president of the West Coast Lumbermen's Association, Portland, Ore., stated that "in the crystal ball it is not difficult to glimpse for the future many encouraging pictures of the lumber business as part of a more closely knit forest industry. Perhaps the greatest promise of all for the industry lies in continued progress in wood technology and in integrated utilization of timber. That has been the most significant development in forestry industry since World War II. Every year we see more integration in the manufacture of forest products at correlated plants under the same management. There seems almost no limit to the skill of wood technologists and industrial engineers in devising new processes and new products from wood. The more dollars they put back on the stump of the tree, the greater becomes the incentive for commercial forestry. The best assurance the United States has today that forestry has become a permanent part of its economy is that for every acre of forest land we have, in all ownerships and all conditions of growth, something over $15 has been invested in manufacturing enterprises for converting and processing wood."

Carpenter Joins Cunningham Machinery Corp.

Cunningham Machinery Corporation, of Shreveport, La., announces the appointment of Roswell D. Carpenter as general manager. Carpenter comes to this position after nearly fifteen years with the U. S. Forest Service, of which the last seven have been spent working out of the Southern Forest Experiment Station, New Orleans, La., in close cooperation with the lumber industry in the South. He is well known to many southern pine and hardwood operators. Previous to this, his Forest Service assignments included five years on the Monogahela National Forest in West Virginia, and two years in forest research in New England and New York. Other experience includes several years of work in the lumber industry in logging and sawmill operation in the Northeast and three years with the University of Tennessee Agricultural Experiment Station in forest research.

The Cunningham firm intends to extend its operation into the manufacture of mobile sawmill units tailored to fit the needs of sawmill operators. The new manager has special interest and experience in this field.

THE MODERN WAY TO MAINTAIN FIREBREAKS AND ROADWAYS

WEEDONE® BRUSH KILLER 64

and

WEEDONE 2,4,5-T

The new science of brush control through selective chemicals has progressed to the point where woody plants can be killed easily and at low cost. One man with a knapsack sprayer can do the work of a dozen men with brush hooks. What's more, his work has the advantage of being permanent, because Weedone Brush Killer 64 and Weedone 2,4,5-T kill right out to the root tips. Most brush can be killed by spraying while in foliage—some responds best to basal stem or stump application.

Weedone Brush Killer 64, a powerful, economical general purpose brush killer. Kills over 100 woody plants and perennial weeds, including hickory, sweet gum and white oak. Contains the low-volatile butoxy ethanol ester of 2,4-D and 2,4,5-T—the *heavy* ester which reduces danger of vapor damage to nearby susceptible plants.

Weedone 2,4,5-T, for special brush problems—such as brambles, Osage orange, poison ivy, mesquite and certain oaks. Contains the butoxy ethanol ester—the proved killer used successfully on thousands of acres of brush and miles of firebreaks and roadways. Do not rely on unproved substitutes.

Ask your dealer or write to us direct. Free technical bulletins.

AMERICAN CHEMICAL PAINT COMPANY

AMBLER, PA.

Originators of 2,4-D and 2,4,5-T Weed Killers

Chamberlin Named Director, Pennsylvania Association

Appointment of Ralph E. Chamberlin, of Palmerton, as executive director of The Pennsylvania Forestry Association has been announced by P. H. Glatfelter, association president.

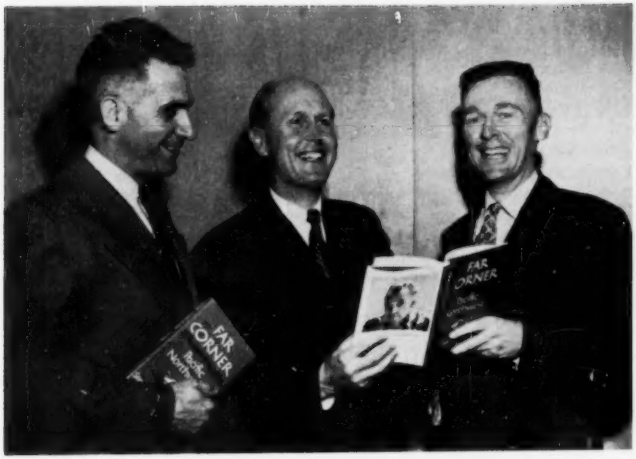
RALPH E. CHAMBERLIN

Chamberlin, a graduate of the School of Forestry at Penn State and a veteran of World War II, has for 18 years been engaged in technical forestry work with the Pennsylvania Department of Forests and Waters. He is also chairman of the Pennsylvania Tree Farm Committee and a member of the Society of American Foresters.

In his service to the state, Chamberlin has occupied the positions of district forester of the Michaux Forest at Fayetteville, assistant chief of the Division of Forest Management at Harrisburg, and since 1945 has been in charge of the state's tree planting program, including the expansion of nursery facilities to permit production of 50 million forest tree seedlings annually.

In his announcement of Chamberlin's appointment Mr. Glatfelter stated simultaneously that the headquarters of the Pennsylvania Forestry Association will be moved from Philadelphia to Harrisburg.

Mr. Glatfelter, who is president of the P. H. Glatfelter Company, at Spring Grove, Pa., called attention to the part which the Pennsylvania Forestry Association has played in the Commonwealth's development over the past 65 years. It is the oldest state forestry organization in the United States, he pointed out.



GOVERNOR ARTHUR B. LANGLIE of Washington displays his well-read copy of the new Stewart Holbrook book, *Far Corner, a Personal View of the Pacific Northwest*, to State Forester Bernard Orell, left, and Mike Lazara, director of the Keep Washington Green Association, at the official opening of the 1952 forest-fire prevention season. Holbrook was the founding director of Keep Washington Green in 1940 and during 1941-1943, when the first Langlie administration and the forest industries cooperated so successfully in protecting growing timber supplies from fire that the Keep Green movement was adopted by Oregon and 29 other states. *Far Corner* is Stewart Holbrook's tenth book. It is packed with up-to-date information about the region's forests and tells many a marvelous story.

Montana Rural Fire Fighters

One of the finest conservation organizations of its kind in the United States is the Montana Rural Fire Fighters Service. In 1951 only one of Montana's 56 counties did not have a volunteer forest, range, and cropland fire fighting organization. In the 55 organized counties there are over a thousand county and district fire chiefs with several thousand men making up these volunteer fire crews. In 1950 seventeen counties held fire training schools and more were held in 1951.

The only money spent is for equipment. Counties are allowed to appropriate $2,500 each per year for this purpose. Additional money for equipment is donated or raised through community events of various kinds. Some districts have organized and assessed themselves. There are now 102 fire trucks and tankers in operation on rural fire fighting units in Montana. Small tools, back pack pumper units, fire hose coupling adapters, first-aid kits, and other fire fighting equipment is available. Savings of crops and improvements credited to these crews during the period 1947-1950 total just under $2,000,000.

Mack "Quality First" Products
for the safe handling of Pulpwood and Ties

Mack GRAPPLES
All-welded steel, combine light weight with rugged strength

Four standard sizes

MACK WELDING CO.
9204 Grand Avenue Place
Duluth 8, Minnesota

SEEDS FOR NURSERYMEN
TREE — SHRUB — PERENNIAL —
FLOWER — VEGETABLE
Correspondence with Seed Collectors Invited
HERBST BROTHERS
Established 1876
92 WARREN STREET NEW YORK 7, N. Y.

new stay-mixed formula

ready-mixed
SOUTHERN GLO
tree-marking paint

Compare these test tubes from which tree-marking paint has been poured. New soft-settling SOUTHERN GLO formula 71020 pours clean . . . saves you time and paint wasted re-incorporating pigment settled out in old formula.

New SOUTHERN GLO does not settle out or form hard base cake, even in prolonged storage. It adheres better . . . costs no more than old types. Yellow, white, red or blue.

Write for literature and prices without obligation.

SOUTHERN COATINGS AND CHEMICALS CO.
Dept. C-2.
Sumter, South Carolina

Leo V. Bodine Named Executive Vice President of NLMA

Leo V. Bodine, 42, has been named executive vice president of the National Lumber Manufacturers Association, Washington, D. C. The NLMA Board of Directors, by unanimous vote, appointed Bodine to this position, effective May 19. He comes to his new post from the Weyerhaeuser Sales Company of St. Paul, Minnesota, of which he has been vice president since 1950.

Bodine has had 23 years of experience in the lumber industry. He began his career in 1929 when he was employed by the Clearwater Lumber Company of Lewiston, Idaho. This company merged with other lumber companies at Potlatch and Coeur d'Alene, Idaho to form Potlatch Forests, Inc., in 1931 at which time Bodine began working in the sales department of the new organization. He continued in the sales department until 1932. In 1934, he left Potlatch Forests, Inc., to join a subsidiary company called Wood-Briquetts, also located in Lewiston. By 1941, Bodine was appointed public relations officer for Potlatch Forests, Inc. He remained in this capacity until 1949 when he left Potlatch to become executive representative for the Weyerhaeuser Sales Company. In 1950, he was advanced to the post of vice president of the company.

He has been very active in lumber industry organizations and since 1950 he has been chairman of the NLMA public relations committee. He is a member of the National Advisory Committee of the American Forest Products Industries, Inc. In addition to these industry posts, he is a member of the National Association of Manufacturers Conservation of Renewable Natural Resources Committee, as well as its Committee on Cooperation with Community Leaders. He is also a member of the Natural Resources and Social Legislation Committees of the U. S. Chamber of Commerce.

Other affiliations include the Idaho State Junior Chamber of Commerce of which he is a past president. He is a member of the Society of American Foresters and the International Concatenated Order of Hoo-Hoo.

Fund to Aid Students

Creation of a regional forestry education fund to attract more students into the field has been recommended by a newly established Committee on Regional Programs in Forestry Education and Research.

The proposed funds would be used for scholarships.

The heads of six southern schools of forestry and representatives of the Southern Regional Education Board proposed the fund at a meeting at the University of Georgia in Athens, February 28.

The educators cited reports showing shortages of foresters and a declining number of forestry students at the same time that demands for trained professional foresters are growing rapidly. Because of industrial development related to wood products, the personnel demand is greater than at any time in history.

The scholarships and fellowships suggested as a means of attracting qualified students would go to young men in the 14 compact states. The committee also has under consideration publication of a bulletin on opportunities and needs in the entire forestry field to be distributed to high schools and youth organizations.

The committee also discussed the possibility of uniform requirements for the first two years of college work, so that a student could enter any of the accredited southern schools of forestry for the final two years and obtain a degree at the end of that period.

The six schools recently entered an agreement, first of its kind in the nation, aimed at coordinating the efforts of all the schools in developing a more effective system of graduate forestry training and research within the South.

The agreement was given substance at the committee meeting, in the agreement that heads of forestry schools would consult with each other before undertaking new programs, and that they would attempt to develop and establish standards of quality for work to be done both at the master's and doctor's degree level.

Dr. C. M. Kaufman, director of the School of Forestry at the University of Florida, was elected chairman.

New Gulf States Forester

The Gulf States Paper Corporation has announced the promotion of D. Virgil Willett to the position of conservation forester, Forest Development Department, succeeding J. William Byrd, who was recently promoted to training director, Personnel Division.

Willett for the past year has been assigned as assistant director ranger, Woodlands Management Department, with headquarters at Carrollton, Ala.

REFORESTATOR
Mechanical Tree Planter

Manufactured by
L. W. MERIAM CO.
Elsie, Michigan

DON'T BREAK YOUR NECK! PREVENT ACCIDENTS!
CUT LABOR COSTS 50% DOUBLE PRODUCTION! With the New, Amazing, **LIGHTWEIGHT ALUMINUM** Comb. Sawing, Pruning, Trimming, Fruit Picking, Shaking Poles.

Curved Type Tree Saw No. 1
AVOCADO PEAR, PEACH & APPLE PICKER No. 12
Fruit Picker No. 6
Pruning Saw No. 3
Hedge Trimmer No. 7
Tree Saw No. 3
SECTIONAL POLES 1/3 WT. OF WOODEN POLES

Combine Sections of Poles to make Poles up to 80 ft. tall. Weighs 1 lb. per 5 ft. 70c per ft. Attachments extra. F.O.B. Los Angeles. No Breakage. No Splinters. Lasts Forever. Sections from 2 to 30 ft. Reaches top of any tree. A 60 ft. pole weighs only 12 pounds. SEND FOR FREE CATALOG & **FREE BOOKLET** HOW TO PRUNE FRUIT & SHADE TREES TELLS YOU HOW TO INCREASE THE QUALITY and QUANTITY of Your FRUIT as Well as the BEAUTY OF YOUR TREES.
J. J. Seabrook Corp.
300-S. Los Angeles St.
Los Angeles 13, Calif. - MA. 6-9397

FOR SALE

Jackson Lumber Harvester portable trailer-sawmill; ideal for custom sawing and working small woodlands for selective cutting; excellent tool for farm forestry and timberland consultants; complete with Diesel power unit installed on 1½ ton truck, self-powered portable edger, speed-reduction unit, small tools, and other equipment. Now located in east Tennessee. Write for further information. **Box F, Journal of Forestry, Mills Building, Washington 6, D. C.**

COMPLETE INVENTORY CRUISING SCALE

Hypsometer
Biltmore Scale
Rigid When Open
Flexible 6-foot Steel Tape
Handy Pocket-Size Case 2¼" Dia.
$3.00 EACH
IMMEDIATE DELIVERY
CARL W. GETZ, *President*
KURFEW, INC.
Lansdale, Pa.

Tent Caterpillar Infestations Severe in Localized Areas

Heavy infestations of the forest tent caterpillar, in several areas of the United States, have been reported by the U. S. Deparment of Agriculture. Surveys by various federal and state organizations in 1951 showed Minnesota aspen forests had an extensive infestation—more than 11 million infested areas. North Dakota, Michigan, New York, Maine, Idaho, Louisiana, and Alabama also reported serious local outbreaks of the pest last year.

Although tent caterpillar populations made spectacular advances in North Dakota, Minnesota, and Michigan during the past three years, they have as yet done little permanent damage to the trees. Last year, in the three-state area, only 3,000 acres were treated with the insecticide DDT to control the caterpillar. This total included many small-area sprayings to protect camp-sites or even individual trees of special importanec.

The North Dakota infestation was primarily in aspen and covered about 5,500 acres. The Michigan invasion also in aspen was much larger—covering 800,000 acres at the eastern end of the Upper Peninsula—and was an extension of a tremendous area of infestation in Ontario.

Last year, the forest tent caterpillar caused serious defoliation of cherry, sugar maple, ash, gray birch, and basswood trees over a widespread area of northern New York. About 111,000 acres were reported infested, nearly twice the area in that state known to be infested previously. Dissections of egg masses collected during the winter indicate a very low degree of egg destruction by parasites and a probable heavy defoliation in 1952.

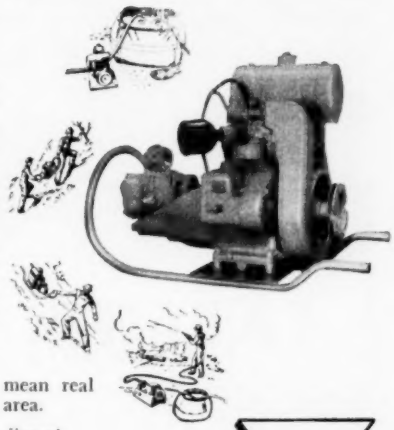
Tupelo and black gum trees were subjected to heavy defoliation by the forest tent caterpillar in Alabama and Louisiana in 1951. About 5 million acres of these two trees, plus large numbers of hickory and oak growing in southwestern Alabama were attacked. Two million acres along the river bottoms and gum ponds were severely defoliated.

Ninety square miles of poplar and birch near Baxter Park, Maine, and alder growing along streams near Coeur d'Alene, Idaho, also suffered from heavy feeding of the forest tent caterpillar last year. Of more importance, perhaps in the later case, was the migration to and partial defoliation of nearby larch stands.

PACIFIC PUMPERS

AMERICA'S NO. 1 PORTABLE FIRE-FIGHTERS

The sure-starting WA-7, newest of the famous Pacific Pumpers and already an outstanding success in both private and public forest use, is light enough to be carried by hand to source of water, booster tank location, or fire area. It delivers 22 g.p.m. at 50 p.s.i. or 14 g.p.m. at 300 p.s.i., throws a high pressure fog for smothering tactics. Self-priming, positive displacement rotary pump, driven by 4-cycle air-cooled engine, gives you *power* and *portability* that mean real fire protection over a wide area.



Write for data on complete line of Pacific Pumpers, hose, accessories.

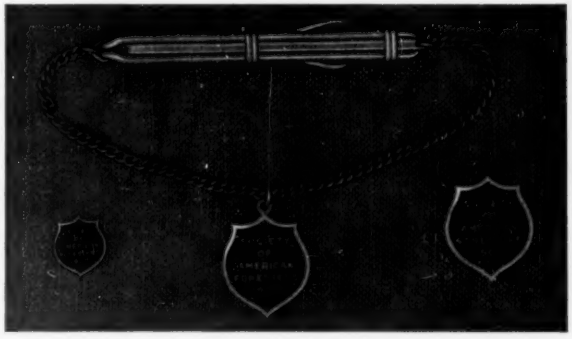
FIRE EQUIPMENT DIVISION

PACIFIC MARINE SUPPLY CO.

SEATTLE 1, WASHINGTON

Distinctive Membership Emblems Available

Let others know that you are proud to be a professional forester.



Button	Tie Chain	Pin
$2.50 ☐	$6.00 ☐	$4.00 ☐

THE EMBLEMS pictured above in actual size are 10K gold, with gold letters on a dark green background surrounded by a gold border. All grades of members are eligible to wear these emblems. Order the style you prefer from:

SOCIETY OF AMERICAN FORESTERS
825 Mills Bldg., 17th St. and Pennsylvania Ave., N. W.
WASHINGTON 6, D. C.

New Governor Endorses Louisiana Forestry Program

At Louisiana's second state tree farm dedication near Minden in April, Gov.-elect Robert Kennon announced plans to increase pine seedling production by 10 times during his administration.

Kennon, speaking at the dedicatory ceremonies on Woodard-Walker properties, said 50 to 75 years would be required to plant Louisiana's unforested lands at the present rate of production. Further, Kennon said he hoped an insurance program for Louisiana forest lands would be forthcoming.

"The Louisiana Forestry Association program," he said, "is in accord with plans of the new administration to make Louisiana more productive. We plan to have every acre of land in the state appropriately used."

The newly elected governor presented tree farm certificates to ten individuals and companies, officially recognizing five years of good forestry practices followed on each tract of land.

Kennon, endorsing the principles of the Louisiana Forestry Commission, and the Louisiana Forestry Association, said, "I am pleased to see control of forest reproduction in the hands of private enterprise. The problem of government in Louisiana and the nation is that of governing least."

Reminding the group "forestry was indeed a foreign word in Louisiana" at the turn of the century, Lloyd P. Blackwell, chairman of the Louisiana Tree Farms Committee, pointed out Louisiana's present 183,610 acres of tree farms stand as a symbol of "trees at work." Louisiana is the 30th state to join the American Tree Farms System.

State Forester James E. Mixon said the tree farm system will "prevent federal regulation of timber cutting."

W. C. Hammerle, chief forester, Southern Pine Association, recounted how the tree farms system began in the South 10 years ago. "The movement now covers 11 southern states, and the area has 55 percent of the total number of farms, with 60 percent of the certified acreage," Hammerle said.

"After this dedication, there will be 1,974 tree farms in the South, representing more than 14,500,000 acres."

Timber Salvage Reduces Importance of Pine Beetle

Prompt salvage of trees infested with the southern pine beetle is credited by entomologists of the U.S. Department of Agriculture with bringing two major outbreaks of this insect pest under control during 1951. The concerted action of timber operations, coupled with efforts of natural enemies of the beetles, reduced this insect's status from that of a major southern forest insect in 1951 to one of minor importance this year.

On the recommendation of the Bureau of Entomology and Plant Quarantine and the Texas Forest Service, operators working in that state last year salvaged 45 million of 55 million board feet of merchantable loblolly pine that had been killed by the southern pine beetle. They also salvaged 36,000 of 50,000 cords of infested pulpwood from the 120,000-acre outbreak area.

In the other heavily infested southern forest area—4,600 acres of the Pisgah-Croatan National Forest in eastern North Carolina—salvage operations removed 200,000 board feet of infested loblolly, pond, and longleaf pine timber.

EARLIER this year!

• The 1952 annual Convention Number of the JOURNAL OF FORESTRY will be published in October this year—a month earlier than in previous years.

• Of broad significance, this issue will tie in with the joint meeting of the Canadian Institute of Forestry and the Society of American Foresters, to be held in Montreal, November 17-20, which may well be the largest and most significant gathering of professional foresters ever held in the Western Hemisphere.

• The Convention Number, therefore, offers exceptional opportunities for all categories of advertisers. Society members can assist in developing advertising for this special issue by (1) acquainting prospective advertisers directly about the Montreal meeting and the Convention Number; (2) encouraging past advertisers to renew space; (3) urging forestry-minded companies which have not advertised heretofore to use space in 1952; and (4) suggesting prospects for purposes of follow-up.

• Space reservations should be made before August 15th. Do it NOW! Address either place:

L. AUDREY WARREN
JOURNAL OF FORESTRY
Mills Building
Washington 6, D. C.

or

LLOYD THORPE
Advertising Representative
JOURNAL OF FORESTRY
209 Seneca Street
Seattle 1, Washington

Forest Farmers Elect

J. Vivian Whitfield of Burgaw, N. C. was elected president of the Forest Farmers Association at its recent Southern Forestry Conference in Chattanooga, Tenn.

Whitfield was formerly Forest Farmer vice-president and succeeds W. M. Oettmeier of Fargo, Ga., as president. Oettmeier spearheaded organization of the association in 1941 and has been president since that time. He will continue to serve on the organization's Board of Directors.

Succeeding Whitfield as vice-president is Henry T. McKnight of Vienna, Va. McKnight is president of Cornwell Pictures, Inc., of Washington, D. C., and is also a timberland owner and part-time farmer.

The Forest Farmers Association is a non-profit forestry association serving the interests of private forestry in 15 southern states. Its members own 13,000,000 acres of forest, making it the largest timberland owners association in America. Since its organization, the Forest Farmers Association has established an enviable record in furthering full forest development and sound forestry legislation.

The directors voted to divide the 15-state Forest Farmer area into 5 regions of 3 states each, to replace the previous three-region set-up. Purpose of this rearrangement was to further localize the association's program.

Elected regional vice-presidents for these five regions were W. S. Beasley of Columbia, Tenn., Arkansas-Tennessee-Kentucky; Fred Dierks, Kansas City, Mo., Oklahoma-Texas-Missouri; Earl Porter, Mobile, Ala., South Carolina-Georgia-Florida; Travis MacClendon, Shreveport, La., Alabama-Louisiana-Mississippi; and Walter J. Damtoft, Canton, N. C., North Carolina-Virginia-West Virginia.

Association directors also elected at this time included: Hugh Kaul, Birmingham, and E. Davidson, Bay Minette, for Alabama; Massey H. Anderson, Monticello, for Arkansas; Alan P. Sherril, Atmore, Ala., and Albert Ernest, Jacksonville, for Fla.; George Gaines, Atlanta, and Donald J. Weddell, Athens, for Georgia; Lloyd P. Blackwell, Ruston, for Louisiana; Russell Haynes, Summerville, for South Carolina; Herman E. Baggenstoss, Tracy City, for Tennessee; and Lacy H. Hunt, Nacogdoches, for Texas.

Association affairs are administered through the Valdosta, Georgia, headquarters with J Walter Myers, Jr., serving as executive secretary.

From the time he leaves his home, General Logging Superintendent Tony Zoffel is in touch with the job via the G-E 2-way radio.

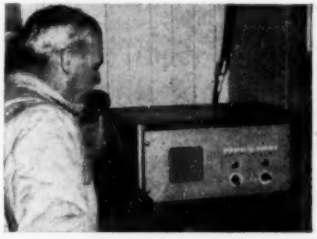
G-E 2-WAY RADIO SYSTEM SPEEDS FIRE CONTROL AT LOW COST

Dependable in any weather, G-E Mobile Units Coordinate Forestry Operations, Pay For Themselves in Savings

FORESTRY and logging plans for fire prevention must depend on a communication system that gives you reliable coverage throughout your operation. In the Mount Rainier area of Washington, the St. Paul & Tacoma Lumber Company has 7 camps scattered as far as 25 miles from headquarters. Elevation differences range from 600 to 4500 feet.

A complete General Electric system of 4 base stations and 10 mobiles has paid for itself many times in operational savings, company officials report. Supervisory travel time alone has been reduced 50%.

Our engineers are prepared to examine your communication problem, too. Mail coupon today for full information on G-E 2-way radio.



50-watt General Electric transmitter is compact, fits into a 2-foot square area. Mounted in watchmen's shacks, these units can transmit clear FM signal as far as 30 miles.

General Electric Company, Section 5872
Electronics Park, Syracuse, New York

Send me latest information on your Communications Advisory Service for forestry and logging groups.

NAME _____

ADDRESS _____

CITY _____ STATE _____

GENERAL ELECTRIC

20 Million
TREES a year!

Yes, every year we start at least that many more trees on the way to hardy, successful tree-hood: Seedlings for Forest and Christmas Tree plantings; Transplants for Conservationists, Timber-operators, Farmers and other owners of idle land.

All our trees are carefully, scientifically nursery-grown. Result: strong, sturdy, well-rooted seedlings and transplants—the kind that live and grow for maximum profits.

MUSSER TREES are

Write for special Christmas Tree Growers' Guide, and complete Wholesale Planting Stock List; or tell us your requirements.

MUSSER FORESTS, INC.

Box 264 INDIANA, PA.

Available Society Publications

Third Cumulated Index

for

JOURNAL OF FORESTRY

$2 Postpaid

For the 11-year period January 1940 through December 1950. All leading articles, committee and meeting reports, and briefer articles and notes arranged by author and key words in the titles. Articles are cross-referenced by subjects as well as by authors. (First Cumulated Index, out of print. Second Cumulated Index — 1930-39 — Available at $1 per copy.)

Forestry Terminology

Price, $3 Postpaid

New, revised, enlarged 1950 edition.

Fifty Years of Forestry in the U. S. A.

370 pages, 18 plates,

Cloth bound, $4

Published in December 1950. This history of forestry tells the dynamic story of the growth of forestry technique and practice of forestry in the United States.

Regional Program In Pulp, Paper Started

A regional program in training and research in pulp and paper is being established by colleges and universities in the South.

Preliminary studies and surveys have been made and tentative agreements reached by representatives of four institutions which expressed initial interest in such a program.

The pulp and paper program is aimed at development of a total program that can more effectively meet both present and future needs of the region in this field of growing economic and industrial value to the south.

The University of Arkansas, North Carolina State College, Alabama Polytechnic Institute, and the University of Florida were represented at a meeting with Southern Regional Education Board representatives at which a tentative memorandum of agreement was drafted.

It provides membership in a regional program by institutions devoting substantial efforts to programs in pulp and paper training and research, and associate memberships for other institutions whose contributions, while smaller and narrower, are significant.

A committee will formulate a regional plan by which the contributions of institutions in pulp and paper training and research can supplement each other.

The Regional Board will provide secretarial, consultant, and research services as needed in formulating the regional plan, will act as fiscal agent for the committee, and will assist the committee upon request in obtaining adequate needed support from legislatures, foundations, industry, government, and private donors.

Oak Wilt Leaflets

Two leaflets, *What You Should Know About Oak Wilt and Oak Wilt Threatens The Nation's Forests* are available from the National Oak Wilt Committee, Box 373, Memphis, Tenn.

Although oak wilt will not spread as rapidly as the chestnut blight, which is wind borne, it has been found in 18 states and is a definite threat to the oak forests. The cooperation of everyone in reporting every outbreak of this disease is essential.

Information on oak wilt is still somewhat limited but much progress has been made in research, for the most part under the auspices of the National Oak Wilt Research Committee.

K&E

SWEDISH INCREMENT BORERS AND FORESTRY INSTRUMENTS

K&E Instruments for forest work are made with the same care and precision for which all K&E products have been renowned for 83 years.

K&E Forestry Equipment includes the K&E Swedish Increment Borer, made of the finest Swedish steel, K&E Tree Caliper, K&E Swedish Bark Measuring Instrument, K&E Timber Scriber, K&E Forester's Compasses, K&E Topographic Abney Levels, K&E Topographic Tapes and K&E WYTEFACE* Diameter (Tree) Steel Tapes.

Ask any K&E Distributor or Branch for further information or write Keuffel & Esser Co., Hoboken, N. J.

*Trade Mark

KEUFFEL & ESSER CO.
EST. 1867

Drafting, Reproduction, Surveying Equipment and Materials, Slide Rules, Measuring Tapes.

New York • Hoboken, N. J.
Detroit • Chicago • St. Louis
San Francisco • Los Angeles • Montreal

AIR PATROL is an integral part of the L. N. Dantzler Lumber Company's and the Gulfport Creosote Company's fire protection organizations. The airplane is used to supplement the detection service of the Mississippi State Forest Service and the U. S. Forest Service tower systems.

In the photo, Flight Contractor F. L. "Sonny" Holleman is shown with his Cub-cruiser airplane consulting on pre-flight plans with John Guthrie, forester for L. N. Dantzler Lbr. Co. Ollie Reeves, fire crew member for the Dantzler Co., is in the Jeep talking over the two-way radio.

Canada May Join Fire Compact

President Truman signed a bill on May 14 clearing the way for the Northeastern States and contiguous Canadian provinces to join hands in an international organization to fight forest fires on either side of the northeastern U.S.-Canadian border.

Sponsored by Rep. Harold C. Ostertag (R., N. Y.) the bill provides for participation by the Canadian provinces of New Brunswick and Quebec in the Northeastern Forest Fire Protection Compact, an interstate mechanism for mutual aid in combatting forest fires. Signatories to the compact now include the six New England states and New York.

Provision was made in the original compact for participation by the Canadian provinces when and if they evinced an interest in joining. The further consent of Congress was required, however, to implement this extension, and this consent is now given in the present bill.

Under the compact, the states of the Northeast, with the cooperation of the U.S. Forest Service, have developed a regional plan to fight forest fires which involves maximum use of local equipment and personnel with a prearranged program of emergency aid on the mutual basis, when and if needed.

Canadian officials have sat in as observers in the development of this program from its inception in 1949, and recently forest firefighting crews from Maine have worked informally with their opposite numbers in the Province of New Brunswick in the development of integrated fire protection programs. Meanwhile, officials of both New Brunswick and Quebec have evinced an interest in joining the mutual aid compact on a formal basis.

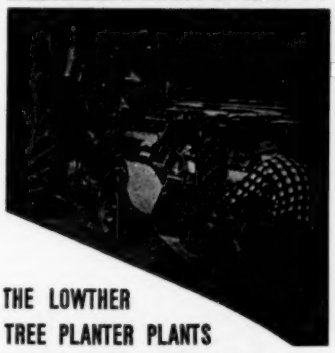
Rep. Ostertag, a former New York State Assemblyman, and chairman of that state's Joint Committee on Interstate Cooperation, assisted as a state legislator in formulating the Forest Fire Compact, and himself sponsored the bill in the New York State Legislature providing for New York's adherence to the compact.

U.S. Firm to Spray Canadian Budworm

Central Aircraft, Inc., of Yakima, Wash., has been awarded the major share of the largest single timber-spraying job yet attempted in Canada. Central has contracted with the New Brunswick International Paper Co., of Montreal, to do approximately 80 percent of a 192,000-acre forest spraying task in the center of the province of New Brunswick, north and east of Maine.

Spray used will be one pound of DDT in one gallon of oil per acre. The area to be treated consists of approximately 300 square miles of balsam fir heavily infested with spruce budworm.

The Bausch & Lomb
BINOCULAR
...World's Best
By Any Test!
Zephyr-Light 7X, 35mm Binocular Balcoted Optics $155, plus tax
In selecting a binocular, look for qualities which identify the true precision optical instrument. Only scientific design and precision manufacture can provide the seeing pleasure of close-up sharpness and brilliance—and a lifetime of service. To learn why Bausch & Lomb binoculars are world's first choice . . . to help you select the best glass for your own use . . . write for a free copy of 32-page booklet "Binoculars and How to Choose Them."
Bausch & Lomb Optical Co., 10807 Lomb Park, Rochester 2, N. Y.



THE LOWTHER
TREE PLANTER PLANTS
10,000 SEEDLINGS PER DAY!

With the Lowther Tree Planter, trees are properly planted for maximum survival in any soil because they have been given the right start.
Three distinct models available to cover all soil conditions and terrain.

●

For details write:

THE HARRY A. LOWTHER COMPANY
INDUSTRY AVE., JOLIET, ILL.
By The Makers Of The Famous Lowther C-Saw

Spruce Budworm

North America's most dangerous forest insect—the spruce budworm—is being successfully curbed in the Pacific Northwest, but the pest is threatening outbreaks in areas of Montana and Idaho, and in Canada near the Maine border, according to a report of the U. S. Department of Agriculture.

Three years of concerted effort by federal, state, and local organizations against the budworm in the Douglas-fir and white fir forests of Washington and Oregon has cost approximately $2,300,000, but it has saved $63,000,000 worth of timber as it stands in the forest. The survey report of the USDA's Bureau of Entomology and Plant Quarantine indicates that timely use of DDT during the past three years has reduced the area of heavy infestation from 887,000 acres in 1949 to 82,000 acres this year. Tree mortality has been confined to less than 10,000 acres. Airplane spraying of more than 2 million acres of budworm-infested forest lands in the two states has been carried on since the intensive campaign was started. An additional 640,000 acres will be treated with DDT this year, and in 1953 the control job on all areas should be finished.

Infestations in the spruce-fir types have declined naturally in the Northeast, but the heavy build-up of the insect in the same forest types in New Brunswick and eastern Quebec makes the situation serious in those areas. Plans are being made to DDT-spray some 200,000 acres of threatened timberland in New Brunswick this year. Budworm invasion 30 years ago cost 30 million cords of pulpwood.

In Montana and Idaho, more than 1¼ million acres of Douglas-fir trees are reported infested, and the budworm is threatening the main Christmas tree growing area of Montana, as well as sawtimber stands. Airplane spraying with DDT has been recommended for about 37,000 acres this spring.

The jack-pine form of the budworm reached epidemic proportions on nearly 1½ million acres of jack pine timber in northern and central Michigan in 1951, and entomologists believe damage to jack-pines to be on the increase. Airplane spraying with DDT successfully controlled this insect on one 4,350-acre area in the northern part of the state.

New Information Chief for Forest Service Region 9

Hamilton K. Pyles, supervisor of the Cleveland National Forest, San Diego, Calif., has been named assistant regional forester of the North Central Region, U. S. Forest Service with headquarters in Milwaukee, Wis.

Pyles will fill the vacancy caused by the death of Assistant Regional Forester Vico C. Isola last December. He will direct all information and educational work on the 14 national forests of the region, which covers the states of North Dakota, Minnesota, Wisconsin, Michigan, Missouri, Illinois, Indiana, Ohio, and Iowa.

Pyles started his career with the Forest Service as a seasonal employee in 1931. His service since that time has been in Region 5 of the Forest Service in California. From 1937 to 1940 he was assigned to the Sequoia National Forest as forest engineer, and later as district ranger at Bakersfield. He worked on the Lassen, Stanislaus, and Modoc forests from 1941 to 1946 as staff officer, assistant supervisor, and acting supervisor. He became supervisor of the Cleveland National Forest in 1946.

Forest Insect and Disease Consultants Announced

Secretary of Agriculture Charles F. Brannan has appointed six consultants to consider ways of strengthening forest insect and disease control activities. The group held its initial meeting in Washington, D. C., May 26-27.

The consultants are: Walter Damtoft, assistant secretary, Champion Paper and Fiber Co., Canton, N. C.; D. Clark Everest, president, Marathon Corp., Rothschild, Wis.; Ernest Kolbe, forester, Western Pine Assn., Portland, Ore.; Fred H. Lang, president, Association of State Foresters, Little Rock, Ark., Dr. A. M. McAndrews, professor of forest entomology, Syracuse University, Syracuse, N. Y.; and Fred W. Roewekamp, city forester, Los Angeles, Calif.

Florida Forestry Council Views Timber-Livestock Production

At the spring meeting of the Florida Forestry Council, held May 15 on the 25,000-acre tract of the Container Corporation of America, near Brooker, Fla. members saw integrated timber and cattle production in operation. Seamon K. Hudson, woodlands manager, explained the company's program which was started in June 1950. The primary purpose is the growing of trees; cattle raising is secondary. The cattle plan involves the crossing of range cows with Brahma bulls, the planting of selected grasses, and fertilization to provide improved pasture.

The Florida Forestry Council was formed in 1950 to study and promote the best use of Florida's forest soils and to help solve problems relating to continued production of timber and other wildland crops.

TWO NEW ONES!

The Improved 1952 REDHEAD

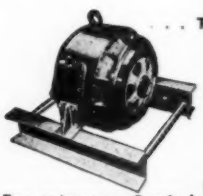
The HEVI-DUTY REDHEAD Power to Spare for Heavy Duty Sawing

Both Right! in DESIGN WEIGHT PERFORMANCE PRICE

See Your Dealer or Write Woodboss Direct

WOODBOSS, Inc.

1800 S. E. Union Ave., Portland 14, Oregon



. . . TWO IN ONE

TORCON

TORQUE CONVERTER AND HYDRAULIC COUPLING

Simple Construction—Extremely rugged—Easy maintenance—Completely hydraulic—No mechanical connection—Automatic adjustment—No pressure on oil seals—Minimizes load shocks—Self-lubricating—Hydraulic fluid—SAE 10 Turbine Oil

For Information Write

C. M. LOVSTED & CO., INC.

4000 W. Marginal Way, Seattle 6, Wash.

Branch Offices in Los Angeles, Calif., San Francisco, Calif., Vancouver, B.C., Honolulu, Hawaii, Manila, P.I.

Industrial Forestry Association Replaces F.C.C. P.N.F.I.

After struggling along for years with the longest organization name in use, Douglas-fir forest landowners adopted the simple "Industrial Forestry Association" title effective May 1, according to E. P. Stamm, Portland, president, of the group.

Known for years as the Joint Committee on Forest Conservation of the Pacific Northwest Loggers' Association and West Coast Lumbermen's Association, and more recently by the equally mouth-filling designation, Forest Conservation Committee of Pacific Northwest Forest Industries, the shorter name will be welcomed by press and public alike, Stamm believes.

The Industrial Forestry Association will continue to promote forestry on private land through the West Coast Tree Farm program, which is the association founded in 1941. IFA will continue to represent private forest industry before public bodies, and will carry on extensive public relations work to acquaint the public with progress, problems and needs of long-term forestry on private lands in the Northwest. It will work cooperatively with state and federal agencies in improving protection against fire, insect, and disease. It will conduct demonstrations and give technical assistance to show how private forest lands can be managed as a long-range crop. Membership in IFA is open to all private forest landowners, including farmers, logging operators, lumber and plywood firms, pulp and paper manufacturers in western Oregon, Washington, and northern California.

W. D. Hagenstein is chief forester. Other officers are: H. V. Simpson, Portland, manager; and Harris E. Smith, Portland, secretary.

IFA maintains branch offices at Seattle and Eugene, and three district foresters, W. A. Tinney, Seattle; N. E. Bjorklund, Portland; and H. R. Glascock, at Eugene.

Floyd Hart, Medford, serves as vice chairman of the three-state Douglas-fir forestry group. Oregon members of the board of directors include: J. S. Brandis, Dallas; R. P. Conklin, Portland; N. B. Giustina, Eugene; Edmund Hayes, Portland; N. B. Hult, Junction City; C. W. Ingham, Marcola; and E. W. Pease, Medford.

Washington board members are: A. H. Brandis, Longview; E. T. Clark, W. B. Greeley, T. R. Sheldon, Seattle; Henry Dennis, Everett; G. L. Drake, Shelton; L. J. Forrest, Hoquiam; D. A. Kurtz, Aloha; C. S. Martin, Tacoma; R. F. Morse, Longview and Corydon Wagner, Tacoma.

Stamm urged the support of all private forest landowners and the general public in helping push forward to the IFA objectives of better forest protection, more efficient timber growing and harvesting, and more complete wood utilization. He said the forest industries brought $1,700,000,000 in new cash into Oregon and Washington in 1951, and that the region could support such a forest economy perpetually if forest practices continue to improve and the woods are protected adequately from destructive forces of fire, insects, and disease.

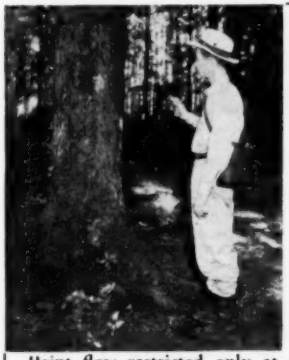
Michigan Tree Planting

Unprecedented interest in spring tree planting wiped out the entire Michigan Conservation Department nursery stock available for the season.

Even jack pine seedlings were exhausted this time, reports the department's forestry division. Some 6,000,000 trees went for private reforesting work and about 3,500,000 seedlings for state forest planting.

FILSON
BETTER OUTDOOR CLOTHES FOR MEN OF THE FOREST SERVICE
SINCE 1897
FILSON MAKERS OF OUTDOOR CLOTHES
MAIL ORDERS FILLED POSTPAID
FREE ILLUSTRATED COLOR BOOKLET SENT ON REQUEST
Weatherman's OUTDOOR WEAR
1300 First Avenue Seattle, Wash.

When writing to advertisers please mention that you saw it in the JOURNAL OF FORESTRY.



A PRACTICAL TREE MARKER

FOR efficient, economical spot marking of trees we offer the *Panama* tree marking gun—designed and engineered in close cooperation with foresters for speed, convenience, economy, long, trouble-free life.

HEAVY guage steel, bronze welded tank, subject to hydrostatic test of 50 lbs. Large capacity air pump enables operator to build pressure quickly with little effort. Paint flow restricted only at nozzle which cleans itself as trigger is operated—constant pressure enables operator to spot mark tree without dribbling paint—operating range 16 ft.

STRAPS adjustable for carrying in various positions—handle also for carrying by hand. Built-in wrenches for hose couplings and fittings; Suitable for all types Tree Marking Paint; Simplicity of design provides for complete disassembly for easy cleaning; Maximum capacity: 1 Gallon. Sufficient to double spot mark 500 or more trees without refilling. Price $21.50 F.O.B. Hattiesburg.

Write for Folder M

PANAMA PUMP COMPANY
Hattiesburg, Mississippi
Manufacturers of
PANAMA FOREST FIRE PUMPS
And Other Equipment

Calder's Forest Road
ENGINEERING TABLES
Ready figured, for professional and axe handle engineers. Great time saver. The condensed experience of 30 years in the woods. Unbeatable for laying out roads. Absolutely weatherproof. Will send on approval (in U. S. only) to foresters and engineers for two weeks trial. Ask for it.
LESTER E. CALDER and DOUGLAS G. CALDER
1028 Hilyard St. Eugene, Oregon

FORESTRY SUPPLIERS,
INCORPORATED
BATTLEFIELD STATION
JACKSON 4, MISSISSIPPI
Successors To
Jim Craig Supply Service
Professional Supplies
FOR
Foresters and Timber Growers
Mail Orders Invited
Catalog on Request

Dri-Vac Wood Preserving Plant

Installation of a Dri-Vac wood preserving plant in the frame factory of Deer Park Pine Industry, Inc., Deer Park, Wash., is announced by that company and the Protection Products Mfg. Company, Kalamazoo, Mich. The unit utilizes the Dri-Vac protection process and Woodlife water repellent preservative to treat wood window frames, siding knotty pine paneling, and other wood products on a rapid production basis.

Entire truck or pallet loads are placed on an elevator in the 17-foot long vacuum chamber where the air is partially evacuated from the wood cells. In the next state of the automatic cycle the loads are lowered into the preservative bath where uniform penetration and distribution of the woodlife are controlled by vacuum. In the final stage the excess solution is removed from the wood by increased vacuum and the surface is dried by the rush of air re-entering the vacuum chamber. Millwork items so treated are protected by Dow Penta and other chlorinated phenols contained in woodlife.

The chief advantage of this process over the cold-dip method of treating is more rapid drying of the wood surface so that glazing or painting can be done more quickly. The Dri-Vac process was developed by Protection Products Manufacturing Company in 1945. Adaptation of the process to rapid treatment of millwork and other fabricated wood products is a recent development, and the Deer Park Pine Industry unit is the first of several to be installed in large production plants in the near future.

Perry, Geneticist, Appointed To Florida University Staff

Thomas O. Perry has been appointed assistant professor in the School of Forestry, University of Florida, effective May 1. He will conduct research in forest genetics and develop the basic requirements for graduate instruction in that field.

Perry has the B.S. and M.A. degrees from Harvard University and received the Ph.D. there in June of this year.

His major research was directed by Dr. Scott Pauley of the Maria Moors Cabot Foundation for Botanical Research, Harvard, and Dr. Karl Sax of the Arnold Arboretum. During the past six month he was employed as a forest geneticist at the Lake City Branch of the Southeastern Forest Experiment Station.

North Dakota Sawmill School

Sawmill operation training and instruction in lumber production was given this spring at the School of Forestry, Bottineau, N. D., by Floyd T. Ryan, farm forester. The sawmill operators training school was the first to be held in the state.

Sawmill operators are needed in North Dakota for operations in the Turtle Mountains, along the Missouri River, and other sections scattered over the state.

The men attending the school were given training in maintenance of a sawmill, breakdown of logs into various grades of lumber, and instruction in trouble-shooting especially where mechanical defects result in mismanufactured lumber.

The interest in the sawmill school developed so that several additional requests have been received inquiring concerning the possibility of attending future sawmill operators schools.

Consulting Foresters
Professional Services Offered by
Members of the Society of American Foresters

FOREST APPRAISALS FOREST TAXATION
GROWTH AND MANAGEMENT PLANS
FRANK J. LEMIEUX
Consulting Forester
25 Years' Experience in North and South America
833 WHITNEY BLDG., NEW ORLEANS 12, LA.

Reforestation Arboriculture
S. GAYLEY ATKINSON
Consulting Forester
Huntingdon Road
Huntingdon Valley, Pa.

FOREST PROPERTY
Estimates—Appraisals—Management
Prentiss & Carlisle Co., Inc.
107 Court Street Bangor, Maine

Complete Professional Service
WILLIAM A. EASTMAN, Jr.
Consulting Forester
Telephone SEneca 2814
410 J. Green Bldg. SEATTLE 1, WASH.

TURNER and SHANNON
Registered Surveying
Consulting Forestry
Forest Management Reforestation
KITTANNING, PENNSYLVANIA

SAMUEL A. NEWMAN
Forest Engineer
Timber Cruiser
P. O. Box 156
Everett, Washington

POND & MOYER CO., INC.
Consulting Foresters
Estimates—Appraisals—Surveys
Machine Tree Planting Service
107 HOMESTEAD RD., ITHACA, N. Y.

Williamson, Forest Service Information Man, Retires

Francis E. (Scotty) Williamson Jr., information specialist, who has been an employee of the U. S. Forest Service since 1921, with the exception of three years service in the Army during World War II, retired in May.

Williamson is widely known throughout the Pacific Northwest region not only for his work with the U. S. Forest Service in Portland and Seattle, but for the active part he has taken in winter sports activities, various civic groups, the American Legion, and youth organizations.

As recreation ranger on the Mt. Hood National Forest he planned and assisted in many developments of that area including the site planning for Timberline Lodge. He was responsible also, for the first organized ski patrol on the slopes of Mt. Hood in 1927.

The National Council of Boy Scouts of America has awarded the Silver Beaver to Williamson for outstanding volunteer work in the Portland Area Council; the Girl Scouts of the United States of America has presented him with the Golden Thank You Badge for help with their outdoor program, and recently he was awarded the Luther Halsey Gulick Award for outstanding generous service to American girlhood, by the Campfire Girls. Also, in 1952 in honor of his scouting record of 41 years as a Scout and Scouter, the Covered Wagon District (Portland Area) established the "Scotty Williamson" Perpetual Trophy.

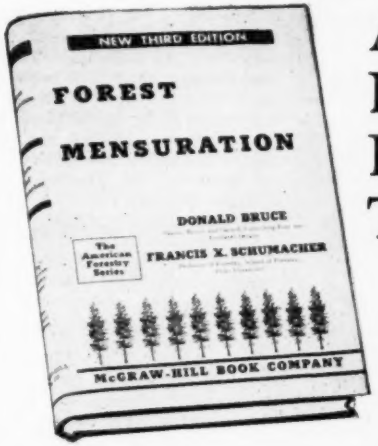
A veteran of both World Wars, Williamson was awarded the Purple Heart and Silver Star for gallantry in action, and the World War I Victory Medal with two battle clasps. Also, the "Verdun Medal" of the French government. In World War II he received the medal for service in the American Theater and the Victory Medal.

Report on Forest Yield Tax

A report on the forest yield tax, now in effect in 14 states, has been issued by the U. S. Department of Agriculture.

The 52-page report, *Forest Yield Taxes*, is based on studies made by the U. S. Forest Service. The publication has special value to state legislators and others considering legislation in the tax field.

The booklet (Circular 899) is for sale at the Superintendent of Documents, Washington 25, D. C. for 20c per copy.



A Leading Forestry Text

Third Edition
467 pages
$6.00

A VERY popular, elementary text, this volume places primary emphasis on the *tools* of forest mensuration. It is the author's contention that mere classroom study of the theory of forest mensuration leaves the student inadequately prepared to cope with practical situations which may not always conform to standard procedure. Specific, local conditions may necessitate adaptations and innovations. The student who can handle the tools of forest mensuration with confidence is in a position to adjust to the various demands of any situation.

THUS the conventional order of treatment in most texts has been abandoned, and, instead of the familiar sequence of scaling, estimating and growth studies, an arrangement had been sought which will facilitate the progressive acquisition of the ability to handle the tools of mensuration. Procedures, which have been the main concern of previous texts, here appear merely as examples. It has been found possible, however, by a judicious selection of these examples, to include solutions of all the common practical problems. The exercises and problems at the end of most chapters are selected with a view to stimulating as much independent thinking on the part of the student as possible.

Other Important Books

ECONOMICS OF PRIVATE FORESTRY
By RALPH W. MARQUIS, Forest Economist, U. S. Forest Service. *American Forestry Series.* 219 pages, $3.50

HARVESTING TIMBER CROPS
By A. E. WACKERMAN, School of Forestry, Duke University. *American Forestry Series.* 437 pages, $6.00

FOREST INFLUENCES
By JOSEPH KITTREDGE, University of California. *American Forestry Series.* 386 pages, $6.00

TEXTBOOK OF DENDROLOGY
By WILLIAM M. HARLOW, Syracuse University, and ELWOOD S. HARRAR, School of Forestry, Duke University. *American Forestry Series.* Third Edition. 555 pages, $6.00

Send for copies on approval

McGraw-Hill Book Company
330 West 42nd Street New York 36, N. Y.

Forestry Employment

S.A.F. members are privileged to insert one 60-word advertisement in this column without charge. Forest industries desiring to employ foresters may insert advertisements at the rate of $4 per column inch. Copy must be received by the end of this month for an advertisement to appear in the issue after next.

Obviously, the Society cannot assume responsibility beyond making it possible for prospective employee and employer to enter into negotiation.

Positions Available

Wanted insect and disease control forester by a well-established mid-Atlantic state forestry department. Must be a graduate major in forest insects and diseases and have several years practical field experience. In first letter state school, experience, and expected salary. Excellent opportunity.
Box B, Journal of Forestry, Mills Building.

OSMOSE WOOD PRESERVING CO. OF 1437 BAILEY AVE., BUFFALO 12, NEW YORK, has openings for permanent work with good remuneration in pole inspection and brush control. Travel is necessary. **Please write Utilities Division for information.**

Foresters located in field east of Great Plains wanted to collect ownership data in spare time. If you are able to compile forest ownership data from county records (knowledge of forest cover in area essential), write for instructions. Payment will be made on production. Accuracy essential. Future employment opportunities may develop. **Box D, Journal of Forestry, Mills Building, Washington 6, D. C.**

W.S.C. Foresters Learn About Tree Farm Progress

Following a tree planting program, which concluded the annual "Conservation Week," the Washington State College Forestry Club held its annual banquet, as which C. R. Richen, chief forester for the Crown-Zellerbach Lumber Company, spoke on the future trends in forestry, and showed a film produced by the Crown-Zellerbach Lumber Company entitled *Forests of the Future.*

His speech "Trends on Tree Farms" included a discussion of eleven ways in which his company is advancing toward permanent production of wood products: (1) An increasing employment of foresters; (2) The responsibility of all levels of supervision for tree farm management. He stressed the advantage of a management team including forestry staff, logging superintendent, contractor, labor, cooperative agencies, and community representative who jointly review plans. (3) The continual improving of woods utilization has been the result of better prices and greater demand for low grade wood and has resulted in the lowering of fire hazard and the increase of integrated manufacturing plants. (4) Forest practices provide for a more adequate seed source. (5) Extensive investigations have been carried out on aerial seeding. Some of the other points covered were (6) increased thinning of young stands, (7) training of personnel, (8) fire protection, (9) multiple use, (10) cooperative efforts between agencies, and (11) improved public relations.

OSC Snellstrom Forestry Award Fund Increased

The John R. Snellstrom forestry award, created in 1948 in memory of the late prominent Lane County Oregon legislator and lumberman, has been increased to $2,500 with the latest $500 contribution from Mrs. Mary E. Snellstrom of Eugene.

Interest from the fund is awarded annually to the outstanding junior forester, according to Dean Paul M. Dunn of the school of forestry. This year's winner is John A. Tucker Jr. of Marcola.

National Forest Receipts Continue to Rise

Receipts from national forests increased $13,721,552, or 36 percent, for the first three quarters of fiscal year 1952 over receipts for the same period a year ago.

At the three-quarter mark, ended March 31, the U. S. Forest Service reported that national forest receipts for 1952 totaled $51,013,683 as compared to $37,292,130 for a year ago.

Approximately 95 percent of the receipts were from the sale of timber and related products. The remainder was collected for the grazing of cattle, sheep and horses, and the occupancy of lands for resorts, camps, summer home sites, rights-of-way, and power sites.

FORESTERS WANTED

State Forester wants capable professional foresters for an expanded, live-wire forestry program emphasizing timber management. New salary schedule, state retirement program, group insurance.

Write: JIM CRAIG
State Forester
Box 649
Jackson, Mississippi

Positions Wanted

Forester, 28, B.S., M.F., Forest Management. Desires public relations job requiring writing, photography, contact work, public speaking. 3 years' experience, large lumber company, public relations, company magazine work, also Junior Chamber of Commerce, Toastmasters. Have presented a number of speech and film programs to service clubs and other community groups. Married. References and details on request.
Box C, Journal of Forestry, Mills Building, Washington 6, D. C.

Forest pathologist, age 33, veteran, married, two children. M.F. Currently treminating doctorate work in forest pathology. Five year record of teaching and research in state colleges and Division of Forest Pathology. Desires position in teaching, research, public relations, editorial, or sales.
Box E, Journal of Forestry, Mills Building, Washington 6, D. C.

HERE'S PROOF *that* OSMOSE TREATED LUMBER *Lasts Longer*

The board at the left is a piece of Osmose treated Lumber and was subjected to severe exposure tests. Upon examination it was found to be strong and healthy, unaffected by fungi or wood destroying insects.

This piece of ordinary, untreated lumber was subjected to identical exposure tests and the difference in appearance speaks for itself. This board had lost most of its natural strength, crumbled in the hand and was practically consumed by pests that habitually attack unprotected wood.

The light areas in these cross sections from Osmose treated posts graphically portray the deep penetration of the toxic salts. Small dark areas deep in the center of the wood are only spots not fully protected.

Here's what happens when you build with untreated lumber that is subjected to moisture. This porch built directly on the ground would have lasted 3 to 5 times longer if it had been constructed of Osmose treated Lumber.

★ ***WON'T ROT!***
★ ***REPELS TERMITES!***
★ ***LASTS 3 TO 5 TIMES LONGER!***

Men who know lumber also know that lumber doesn't just wear out . . . it is literally "eaten up" by fungi and hordes of wood destroying insects. However, Osmose treated Lumber stops these pests cold! Osmose treated Lumber is ordinary lumber that has been treated with Osmosalts (a highly toxic chemical mixture) that makes it resistant to decay and termites.

Naturally, the user pays a small premium for Osmose treated Lumber, but when you consider that it lasts 3 to 5 times longer, is fire retardant and NEED NOT BE PAINTED, the use of untreated lumber appears impractical indeed. Osmose treated Lumber, unpainted, is ideal for modern ranch-type houses, cottages, barns, outbuildings, bridges and all types of industrial construction. If you prefer, Osmose treated Lumber can easily be painted and the green treatment color acts as a base coat, thereby saving on paint.

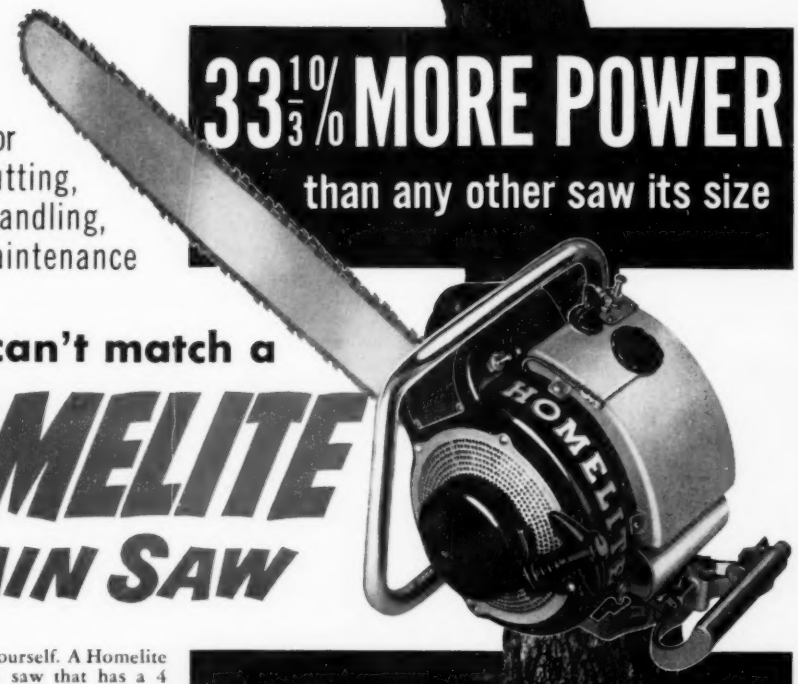
Everything we say about Osmose treated Lumber has been proven over and over again during the past 15 years by our users as well as the Federal Government who have made exhaustive tests. Proof of these service tests is on file and you may have copies by writing to our headquarters. Osmose treated Lumber is sold through Authorized Producers whose operations are supervised and directed by graduate foresters trained specially by the OSMOSE WOOD PRESERVING CO. OF AMERICA, INC., 1437 BAILEY AVE., BUFFALO 12, N. Y.

OSMOSE TREATED LUMBER

33 1/3% MORE POWER

than any other saw its size

For
fast cutting,
easy handling,
low maintenance



You can't match a

HOMELITE CHAIN SAW

Just figure it out for yourself. A Homelite is the only one-man saw that has a 4 horsepower engine . . . a 4 horsepower *Homelite* engine, known for more than a quarter century as the finest lightweight two-cycle engine ever developed. That means more power . . . much more power . . . to cut faster with less strain on the operator, with less wear and tear on the saw, with less down time for sharpening or repairs.

And you get all this power in a lightweight, perfectly balanced saw that handles with complete ease . . . whether you're notching, felling, trimming or bucking. Yes, whether you are cutting large trees or small trees . . . hardwood or softwood.

Try it! See for yourself why this saw is the talk of the woods. See for yourself why no other saw can match it . . . for dependable, durable, *profitable* performance, on all jobs, at all times. Write for name of your nearest Homelite Chain Saw dealer, today.

Manufacturers of Homelite
Carryable Pumps • Generators
Blowers • Chain Saws

PERFORMANCE · DEPENDABILITY · SERVICE

HOMELITE
CORPORATION

4107 RIVERDALE AVENUE • PORT CHESTER, N. Y.